1908.

VOLUME
TWENTY-SEVEN.

JANUARY
—JUNE.

The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER

APPEALING TO THOSE ENGAGED IN

THE ART OF BUILDING.

It is our aim, our ambition, our aspiration even, to build our Journal worthily and well, not for the hour only, but for future years; for the few men in the forefront of an enduring and a laborious art; for the disciplined ranks of a distinguished profession; for the young men—Architects to be—and for all who love a clustered column or a flying buttress, a traceried window or a Greek frieze; for the man, too, who honestly plumbs a jamb. . . . .

CAXTON HOUSE, WESTMINSTER

TECHNICAL JOURNALS LIMITED

CONTENTS.

CONTRACTORS' SECTION.

FIRE-RESISTING CONSTRUCTION SECTION.

CONCRETE AND STEEL SECTION.

ILLUSTRATIONS.

ARTISTS AND AUTHORS.

DESIGN F

HOSPITAL.

January 1, 1908. Volume 27, No. 673.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER

Notices.

Offices: 6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 2200 Holborn (6 lines).

Date of Publication: The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Sectiou," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The "Concrete and Steel Section," is given in this issue.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Braneh." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

Our Christmas Issue.

We are glad to be able to state that our Christmas issue has been an unqualified success. Letters have reached us from all parts of the Kingdom expressing admiration for the collection of buildings illustrated and the excellent manner in which they are reproduced; expressing astonishment, also, that so large an issue could be produced at so small a price. We have been much gratified in receiving these letters, because they assure us of the continued support of our many readers and are a grateful recognition of the trouble and expense entailed in the production of the issue in question. As we anticipated, this issue went out of print within a few days of its publication, with the result that we are inundated with applications for copies which the publisher is unable to supply. It has come to our knowledge that certain newsagents have been selling copies at 2s. 6d. This is quite unauthorised by us. The price of the issue was 4d., which amount is clearly printed on the cover. If, however, newsagents can find purchasers at 2s. 6d., or at even a higher figure, it is a matter in which we cannot interfere. At the same time, in order to prevent any misunderstanding, we think it desirable to clearly point out in these columns that the authorised price of the issue is 4d. only.

The Report on Building Accidents and Their Prevention.

The committee appointed by Mr. Gladstone in 1906 to enquire into the dangers attendant on building operations, and to draw up draft regulations for their prevention, has at length finished its labours, and the result is embodied in the voluminous report issued last week from the Home Office. In our next issue, which will include the "Contractors' Supplement," we shall publish the regulations in full, with our comments thereon, but we may here give a summary of the chief proposals, with some expression of opinion on our own part.

The draft regulations are 46 in number. Appended to them is a memorandum signed by two members of the committee expressing disagreement with one of the suggested regulations, and another memorandum signed by one member expressing disagreement with the remainder of the committee on several points embodied in the report. It is to be regretted that complete unanimity has not been shown by the committee as a whole, although, perhaps, this was hardly to be expected, considering that the members were chosen as representatives of all classes connected with the building trade, and must therefore, as units, have held divergent views. However, in the cases where their views did not coincide, it was found possible to find a basis for compromise. The regulations as they stand (but which, it should be remembered, are not yet enforceable) are divided into two parts. The first part contains 41 suggestions, to be observed by the employers, and the second part contains five suggestions as duties imposed upon the workmen. Of the many matters dealt with, the importance of safe scaffolding is one of the first things noticeable. To provide for this, numerous regulations are framed. Some, it is expected, will require further amendment, particularly regulation 5, which limits the projection of the ordinary scaffold board to 6 inches unless fixed by nails or otherwise prevented from tilting. No account seems to have been taken of lapping boards in this regulation. The danger of traps being formed where boards lap is well-known, and it seems that something might have been done to prevent this danger. An addition to the regulation that a support should be fixed under all laps should meet the necessities of the case. The provision of guard rails is provided for, also for the fixing of boards on edge. The guard rail is to be fixed on all platforms above the height of 12 feet. Why this particular height should be chosen, it is difficult to decide. On page 10, however, the committee say that this was arranged as a compromise. It is a pity that a more practical reason could not be given. Other regulations deal with the fixing of guard rails in places on buildings in course of erection, especially around floor openings. Regulation No. 27 is somewhat curiously worded. It provides that each floor of a building below which workmen work or pass shall be covered in such a manner as to be an efficient protection to the men beneath. It is apparently assumed that when men are beneath, work is going on overhead; yet anyone at all conversant with building operations knows that this is not always so. The dangers from the use of machinery are considered, and another regulation deals with the testing and annealing of chains. A new point has been dealt with for the prevention of lead poisoning among painters and plumbers. Three short regulations on this matter are given for observance by the employer, and two for observance by the workmen. Regarded as a whole, the suggestions made appear practical and should meet with general acceptance. It is taken for granted that their arrangement will be altered before they are finally completed. As at present arranged, order and sequence do not seem to have been entirely observed; for instance, runs and gangways are mentioned in rules 6 and 7, and are continued again in rule

13, and suspended and bracket scaffolds are mixed together unnecessarily in rule 23. These are minor details, however, easily capable of remedy; but we commend the idea to those dealing with the matter in the future.

An Important Architectural Competition.

As already briefly reported in our columns, at the special meeting of the Manchester City Council held on December 18th to decide the question as to what should be done with the Old Royal Infirmary site the following resolution was carried :—"That the reports now submitted be approved, and that the Special Committee be instructed to prepare for submission to this Council a scheme embodying instructions to architects for competitive designs for a new building to be erected on the Infirmary site, for the purpose of meeting the requirements of the Libraries Committee, the Art Gallery Committee, and any other committee, or committees, which may be hereafter determined by the Council, on the recommendation of the Special Committee.". The City Council has therefore accepted the principle of a new building—to be erected on the site of the present Infirmary—suitable for the purposes of an art gallery, public library and municipal offices. The debate extended over nearly four hours, during which five amendments, to the following effect, were moved and lost :—(1). That the consideration of the reports and of the disposal of the Royal Infirmary site and buildings be adjourned for twelve months. (2). That the Infirmary buildings be cleared away and the site left as an open space for a period not exceeding three years—the matter to be then re-considered. (3). That, the time not being opportune for the expenditure of a large sum of money in the erection of entirely new buildings on the Infirmary site, the present buildings be adapted for the purposes of an art gallery, museum, and free reference library on the ground floor and upwards, and that the basement be used for such of the tramway undertakings as now find a home in Piccadilly. (4). That the present Infirmary buildings be adapted for the purposes of a reference library and municipal offices. (5). That before any arrangement be made for building a library or art gallery on the Infirmary site it may be cleared of its present buildings, and negotiations entered into with the proprietors of the Royal Exchange to see if an exchange of sites can be effected. The final voting showed 56 members for and 23 against the proposal for the erection of a new building. In moving the resolution the chairman of the Special Committee (Sir James Hoy) gave an outline of the various stages in the movement for the utilisation of the Infirmary site, since it was acquired by the Corporation, and, in connection with its latest development, namely Mr. Collcutt's report as to the possibility of adapting the present Infirmary buildings for library and art gallery purposes, he explained that he had purposely refrained from approaching Mr. Collcutt in any way, so that there could be no possible suspicion of influence on his part. During his criticism of the various alternative proposals for dealing with the Infirmary site, which the Corporation acquired for the comparatively moderate sum of £400,000, Sir James Hoy stated that if they retained the site as an open space they would have to face an outlay of £60,000 or £70,000 for land for a library elsewhere. As to the art gallery, to neglect to provide more accommodation of a satisfactory character would be to divert from the city valuable artistic gifts that would otherwise come to it, and to extend their present art gallery would involve an outlay of £25,000. Thus, by leaving the Infirmary site as an open space, they would be at once committed to an expenditure of something like £100,000 in respect of the library and art gallery. Finally, Sir James pointed out that the Libraries Committee had a reserve fund of £150,000, the Art Gallery Committee had land in George Street of the value of £25,000, and the Art Gallery in Mosley Street was of the estimated value of £180,000; and he was of opinion that all these resources would be available for carrying out the scheme. The proposals submitted by the Special Committee for the utilisation of the much-discussed Infirmary site will therefore be carried out, and we do not doubt that the scheme as outlined by Sir James Hoy is, in many respects, a very practical, sagacious, and far-reaching one. Its one serious drawback is that it involves the destruction of the present building, dating, we believe, from about the middle of the eighteenth century, but apparently, subsequently altered on more than one occasion. The site it occupies is a magnificent one, consisting of a fine, spacious, isolated area, having its longer frontage bounded by Piccadilly, and its shorter one by Portland Place, whilst its broad pavement to the former thoroughfare is adorned with groups of bronzes. Doubtless, many architects of to-day would describe the building as commonplace and uninteresting, but as a matter of fact it is neither the one nor the other. On the contrary, although by no means one of the best examples of its kind, it is designed in a sufficiently masterly and scholarly manner to make us doubt whether, speaking solely from the aesthetic point of view, any of our present architects are qualified to prepare a design so well suited to the site and surroundings as the building about to be demolished by the City Council of Manchester.

The R.I.B.A. Secretaryship.

We understand that the applications for the appointment of secretary received in response to the advertisement recently issued by the Royal Institute of British Architects will be brought this week under the consideration of the special committee appointed by the Council to deal with the matter. In another column we give a brief account of Mr. W. J. Locke, who, as secretary of the Institute for the past ten years, has done yeoman service for the advancement of architecture, and for the general welfare of members of its profession. It will not be, on the whole, an easy task to find a thoroughly suitable successor to Mr. Locke.

Standard Notation for Engineering Formulæ.

A meeting that promises to be of much interest is that of the Civil and Mechanical Engineers' Society which is to be held at 8 o'clock to-morrow (Thursday) evening, at Caxton Hall, Westminster, when a discussion will be opened by the president (Mr. W. Noble Twelvetrees) on the subject of standard notation for engineering formulae. The primary object of the discussion is simply to continue the useful work for which this society was founded nearly half a century ago, but its ultimate result may be to bring about a reform that would be welcomed by all members of the engineering profession, and the value of which to the rising generation of engineers could not well be over-estimated. Probably the best way of arriving at so desirable a consummation as uniform notation would be for the Engineering Standards Committee to take the matter up. That body represents all the leading engineering institutions, and possesses the necessary organisation. If they could be persuaded to undertake the preparation of a British Standard Schedule of Engineering Notation, they would confer an immense benefit on professional and industrial engineers. We are informed that the council of the Civil and Mechanical Engineers' Society would be glad to receive schedules of suggested uses for symbols, or other written communications. These should be sent to the hon. secretary, Mr. A. S. E. Ackermann, 35, Victoria Street, S.W.

Last Year's Failures.

1907 was another bad year for the building trade, but the number of failures in England and Wales was less than in 1906, the figures being respectively 577 and 616; and, from the returns which have just been published, we see that there has been the same decrease in the bankruptcies of other trades and businesses generally. The total number of bankruptcies in England and Wales was 4,803 in 1905; this fell to 4,446 in 1906; and the total for 1907 is now given at 4,090. So far as the building trade, however, is concerned, the fewer number of bankruptcies may perhaps be chiefly attributed to the fact that so much less work has been going on. The figures for the gazetted failures in the building and timber trades in the United Kingdom for the last five years are as follows :—

1907.	1906.	1905.	1904.	1903.
646	683	720	711	710

ARCHITECTURAL INTERVIEWS.

I.—Mr. W. J. LOCKE,

Secretary of the Royal Institute of British Architects.

It is opportune, we think, to commence this new series of architectural interviews with a brief account of Mr. W. J. Locke, the well-known secretary of the Royal Institute of British Architects. Quite recently, as our readers are aware, Mr. Locke has given notice of his intention to resign the Institute secretaryship, in order that he may devote his whole time to literary work; and, being thus very much in the public eye just now, we are sure that some record of his career will be read with interest by his many friends, both inside and outside the architectural profession.

Born on March 20th, 1863, Mr. Locke received his early education at the Queen's Royal College of Trinidad; from there, the fortunate possessor of a Government scholarship, he entered, in 1881, St. John's College, Cambridge. On quitting his *alma mater*, three years later, with an honours degree obtained in the mathematical tripos, and joining the scholastic profession, Mr. Locke became assistant master at public schools, among which we may mention Clifton and Glenalmond. Whilst fulfilling his duties of form-master at the latter school, Mr. Locke was elected, in 1897, from among 50 or 60 candidates, for the responsible position of secretary of the Royal Institute of British Architects, and the wisdom of the choice made by the then Council has since been abundantly justified.

Always a strenuous worker, Mr. Locke has been enabled, despite the exigencies of his earlier scholastic engagements, and of his later secretarial appointment, to charm a large circle of readers with a delightful series of novels, and other works, of which the following may be mentioned (the dates of publication are given in parenthesis):—

At the Gate of Samaria (1895).
The Demagogue and Lady Phayre (1896).
A Study in Shadows (1896).
Derelicts (1897).
Idols (1898).
The White Dove (1900).
The Usurper (1901).
Where Love Is (1903).
The Morals of Marcus Odeyne (1905).
The Beloved Vagabond (1906).

As a dramatic writer Mr. Locke has been equally and deservedly fortunate, for in addition to the great success of "The Morals of Marcus" (produced at the Garrick Theatre in August, 1906), of the original play "The Palace of Puck" (Haymarket Theatre, 1907), and of the dramatised version of "The Beloved Vagabond" (with which Mr. Tree has been touring the provinces), the two one-act plays entitled "The Cynic" (Royalty Theatre, 1899) and "The Lost Legion" (Queen Street Theatre, 1900) have met with a more than average measure of popular appreciation.

It is almost needless to mention that, as secretary of the R.I.B.A., Mr. Locke is acquainted with all the architects of note in the United Kingdom, whilst his knowledge of foreign architects, their methods and aspirations, may be gauged from the fact that he is a corresponding member of the Imperial Society of Russian Architects and of the Society of Portugese Architects, an hon. corresponding member of the Central Society of Spanish Architects, and an hon. member of the Amsterdam Central Society for the Propagation of Architecture, and a member (and secretary of the Bureau for Great Britain) of the Permanent Committee of the International Congresses of Architects.

Whilst, on his part, Mr. Locke regards it, to use his own words, "as a great privilege to have been in the very centre and life of a great profession, by virtue of which I have been enabled to become well acquainted with its celebrities, both at home and abroad," yet there can be no doubt that its secretary's intimate association with foreign architectural societies has been of the greatest value to the Institute; and it also appears to us that some of Mr. Locke's most successful literary work has been the result of the unique opportunities he has thus enjoyed for the close study of architects and their idiosyncracies. For instance, who but an architect, or one who thoroughly understands the artistic temperament, could have produced the following realistic picture?—

"The Café Delphine was far from being the school of discretion and good manners that Paragot frequented in his youth, but such was his personal influence that, when he re-appeared in his usual place, no one dared to allude to the disconcerting incident. Paragot had recovered from the chastened mood and was gay, Rabelaisian, and with great gestures talked of all subjects under heaven. One of the International Exhibitions was in prospect and many architects' offices were busy with projects for the new buildings. A discussion on these having arisen—two of our company were architectural students—Paragot declared that the exhibition would be incomplete without a *Palais de Dipsomanie*. Indeed, it should be the central feature. 'Tiens!' he cried. 'I have an inspiration. Someone give me a soft black pencil; Hercule, clear the table.'

He caught the napkin from beneath Hercule's arm and as soon as the glasses were removed he dried the marble top, and, holding the pencil draughtsmen's fashion, a couple of inches from the point, began to draw with feverish haste. His long fingers worked magically. We bent over him, holding our breath, as gradually emerged the most marvellous, weird, riotous dream of drunken architecture the world could ever behold. There were columns admirably indicated upside down. The domes looked like the top of half-inflated balloons. Enormous buttresses, supporting nothing, leaned incapable against the building. Bottles and wine cups formed part of the mad construction. Satyrs' heads leered instead of windows. The whole palace looked reeling drunk. It was a tremendous feat of imagination and skill. The hour that he spent in elaborating it passed like five minutes.

When he had finished he threw down the pencil—"Voila." Then he called for his drink and emptied the glass at a gulp. We all clamoured our admiration. 'But, Paragot,' cried one of the architectural students in considerable excitement, 'you are a trained architect and a great architect. It is the work of a genius—Garnier himself could not have done it.'

Paragot whipped up the napkin from the seat and before we could protest rubbed the drawing into a black smudge.

'I am a poet, painter, architect, musician, and philosopher,' said he."

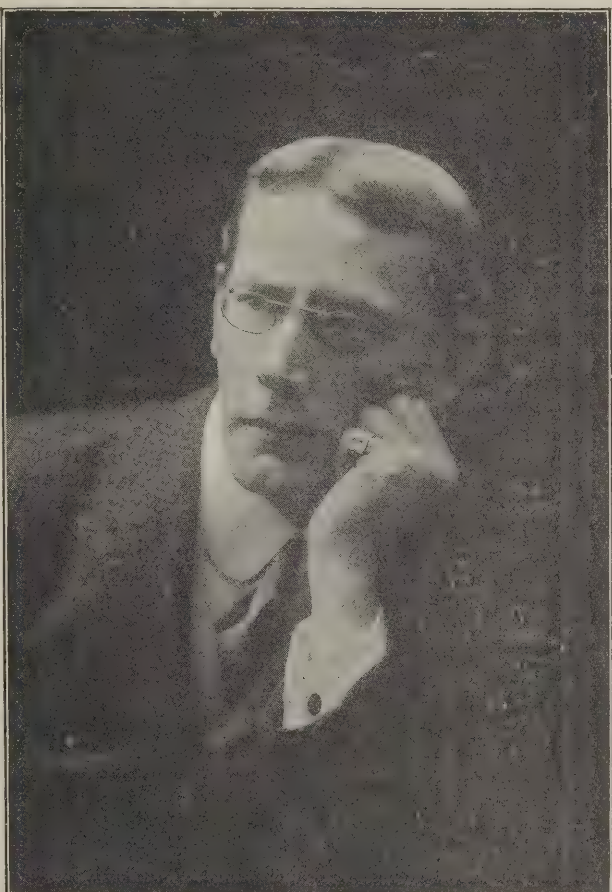


Photo: Dover Street Studios.

MR. W. J. LOCKE, B.A. CANTAB.,
Secretary of the Royal Institute of British Architects

Or, again, when Paragot astonishes his protégé by revealing his early penchant for the study of architecture—

"'I shall resume my profession,' he announced, lighting a cigarette, and in the course of a year or two regain the position to which an ancient *Prix de Rome* is entitled.'

I was destined that day to go from astonishment to astonishment.

'You a *Prix de Rome* master?'

'Yes, my son, in architecture.'

He was clothed in a new and sudden radiance. To a Paris art student a *Prix de Rome* is what a field marshal is to a private soldier, a Lord Chancellor to the eater of dinners in the Temple.

I must confess that though my passionate affection for him never wavered, yet my childish reverence had of late waned in intensity. I saw his faults—which is incompatible with true hero-worship. But now he sprang to cloud summits of veneration. I looked awe-stricken at him and beheld nothing but an ancient *Prix de Rome*. Then I remembered our enthusiasm over the palace of dipsomania.

'They said you were an architect that night at the Café Delphine,' I exclaimed.

'I was a genius,' said Paragot modestly. 'I used to think in palaces. Most men's palaces are little buildings written big. My small buildings were palaces reduced. I could have roofed in the whole of Paris with a dome.'"

We have quoted these passages from (in our opinion) Mr. Locke's best novel—"The Beloved Vagabond"—as being of special interest to architects, but many other selections of equal merit might be made. We may give the following short extract as showing Mr. Locke's power of word painting:—

'Sinking under an infinitely far horizon stretched the fruitful plain of France, cornland and pasture, and near us the stacked sheaves of Paragot's corn stood, quiet and pregnant symbols of the good earth's plenty. Here and there dark patches of orchard dreamed in a haze. Through one distant patch a farm-house struck a muffled note of grey. On the left the ribbon of road glistened white between the sentinel poplars silhoutted against the sky. The hot smell of the earth filled the air like spice. A thousand elfin

sounds, the vibration of leaves, the tiny cracking of cornstalks, the fairy whirr of ground insects, melted into a companionable stillness."

Turning now to the more prosaic side of Mr. Locke's work. When questioned as to his views on the proposal to close the profession to all but trained men, he maintained a discreet silence, and declined to express any opinion, either for or against the project, but he was quite definite in his suggestion that architects should be at some pains to incorporate their individuality in their works, and thus enable the latter to be identified by the general public as the production of a certain architect or school of architects. In other words Mr. Locke considers that the man in the street should be able, at once, to connect a building with its designer, as readily as many laymen can identify the works of well-known painters, and while thus deprecating anonymity, in any form, he instanced the great stimulus that is given to the efforts of the earnest worker, whether in literature or art, by the assurance that his name will be indubitably associated with the product of his pen or pencil.

And now, for the present, we must bid adieu to Mr. Locke, with the confident assertion that, on the forthcoming severance of his close connection with the architectural profession, he will carry with him the good wishes, the respect and warm regard of all with whom he has come in contact. Members of the Royal Institute of British Architects in particular freely recognise that they are under a special debt of gratitude to Mr. Locke (whom many have reason to value as a personal friend) for the unvarying courtesy, zeal, tact and ability with which he has carried out his secretarial duties during the past ten years.

Notes on Competitions.

The London County Hall.

Yesterday was the last day for sending in designs in the final competition for the London County Hall. It will be recollected that in the preliminary competition 99 designs were submitted, and the authors of 15 of these were selected to compete in the final competition, together with the eight architects specially invited. The three assessors are Mr. R. Norman Shaw, Sir Aston Webb, and Mr. W. E. Riley (supertintending architect to the London County Council).

Birmingham Fire Station Designs.

Mr. J. L. Ball, F.R.I.B.A., the president of the Birmingham Architectural Association, has sent the following letter to the chairman of the Watch Committee of the Birmingham City Council:—

"Sir,—The attention of the Architectural Association has been directed to certain comments of the Watch Committee (reported in the public Press) on the designs submitted in competition for the Legge Lane Fire Station, to the effect that the designs are 'a most indifferent lot,' that they contravene the by-laws, and that they are altogether inferior to the plans prepared in the City Surveyor's Office. A censure so general and caustic demands inquiry from those who are charged with the interests of architecture in this city.

The names of the six competitors at once make us incredulous of so sweeping a condemnation and our incredulity is deepened when we remember that the Watch Committee were not assisted by the advice of an expert in architecture. It appears, moreover, that the Watch Committee caused a design embodying their own ideas to be prepared by the City Surveyor, and this is most important, for it places the Watch Committee in the position of an interested party, a seventh competitor, in fact, disqualified to give a serious and impartial judgment. Every competitor naturally prefers his own scheme to the others, though it may be hoped that the preference seldom extends to calling the others 'a most indifferent lot.'

It is, perhaps, permissible to ask whether the instructions issued to competitors were clear and precise, and whether the alleged contraventions of by-laws were really serious or only such small oversights as are common in a first draft, and are easily rectified on revision. For these reasons, and in view of the publicity given to the Watch Committee's remarks, the Architectural Association take the liberty of suggesting that the designs of the six competitors and that of the City Surveyor shall be publicly exhibited, in order that the Watch Committee's strictures may be either justified or disproved.

Wandsworth Infirmary.

At the last meeting of the Wandsworth Guardians the Indoor Accommodation Committee reported that they had considered the details of the design for the proposed new infirmary, as submitted by Mr. J. S. Gibson. The Chairman (Canon Curtis) stated that the committee had considerably modified the original plans, and the cost would be £93,000. The plans would be sent to the Local Government Board if the Guardians agreed. Lieutenant Saunders said that he thought the plans were to be inspected by the public, and in this case considered that such inspection should take place before they were submitted to the Local Government Board. The chairman replied that when the plans were accepted they would be put before the public. The Board unanimously agreed "That the plans as now passed be submitted to the Local Government Board for their approval."

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
Jan. 6	TECHNICAL COLLEGE EXTENSION AT SUNDERLAND.—Limited to architects practising in Sunderland and to the firm who designed the existing college buildings. Premiums £100 and £50. Particulars from John W. Moncur, A.M.I.C.E., Borough Engineer, Sunderland.
Jan. 13	STATUE AT WIGAN to Sir Francis Sharpe Powell, Bart., M.P. Models and sketches. Premiums £50 (to merge), £15 and £10. Conditions from Harold Jevons, Town Clerk's Office, Wigan, Summary in BUILDERS' JOURNAL, November 13th.
Feb. 1	BRANCH BATHS AT ROCHDALE (to cost £7,500).—Premiums £25, £15 and £10. Assessor will be appointed. Conditions from S. S. Platt, Borough Surveyor, Rochdale. Deposit 10s. 6d.
Feb. 1	SECONDARY SCHOOL FOR BOYS AT MAIDENHEAD.—Premiums £100, £50 and £25. Assessor to be nominated by President of R.I.B.A. Conditions from the Secretary, Berkshire Education Committee, The Forbury, Reading. Deposit 5s. Summary in BUILDERS' JOURNAL, December 11th.
Feb. 1	CITY HALL AT PERTH.—To cost £25,000. Premiums £50, £30 and £20. J. J. Burnet, A.R.S.A., F.R.I.B.A., Assessor. Deposit. One Guinea.
Feb. 15	MUNICIPAL BUILDINGS AT SHANGHAI. — Conditions, together with site plan, may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.
Feb. 17	NEW COUNCIL OFFICES, &c., AT RADCLIFFE.—Limited to architects in Lancashire. Assessor, Mr. G. H. Willoughby, F.R.I.B.A. Premiums £75, £50, and £25. Conditions from S. Mills, clerk, Council Offices, Radcliffe, Manchester.
No Date	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1.

THE R.I.A.I.

Some Criticism of Irish Competitions.

The annual general meeting of the Royal Institute of the Architects of Ireland was held in Dublin just before Christmas, the chair being occupied by the newly-elected president, Mr. Frederick Batchelor, F.R.I.B.A. The report of the Council for the past year was presented. Among other matters, attention was drawn to the competition which had been promoted by the Local Government Board for labourers' cottages, to be erected at a cost of £130 each, complete. The Council of the Institute viewed with considerable disfavour both the principle of the competition and the conditions laid down by the Board. They made representations to the authorities, and requested that a deputation might wait on the Board to explain the views of the Institute. The Board, however, declined to receive the deputation. The Institute thereupon drew up a statement which they forwarded to the Board, and as no satisfactory reply was forthcoming, this statement, together with the correspondence that had taken place, was published in the press, and also sent to several members of Parliament and to the Chief Secretary for Ireland. Further correspondence ensued, but the Council regret that "this important public department does not apparently understand that by placing the responsibility for the erection of these cottages in the hands of unqualified men it is not promoting the public welfare; and is, by its action, creating a vast number of so-called 'architects' throughout the country who will engage in practice in competition with qualified men, greatly to the detriment of the public and the prestige of our profession."

Another competition referred to was that for the technical school for the northern district of Dublin, which the Council endeavoured to induce the Corporation to promote. The preparation of the designs, however, was eventually placed in the hands of the City Architect, and the erection of the building is soon to be commenced.

The Council had also taken action with reference to other competitions held during the year, in particular that for the proposed sanatorium for consumptives, promoted by the County Cork Joint Hospital Board. In this latter case, however, the representations made by the Council had been unsuccessful.

Another matter referred to in the report was the withdrawal of the Ulster Society of Architects from alliance with the Institute, and the application of that Society for affiliation with the R.I.B.A., which application was opposed by the Irish Institute, and the objection sustained by the president of the R.I.B.A.; so that "the Royal Institute of the Architects of Ireland still retains its position as the representative body for the whole of Ireland."

President's Address.

After the presentation of the Council's report, Mr. Batchelor delivered his presidential address. Referring to the question of the education of the public in architecture, he said that the secret which lay at the bottom of a great deal of the employment of unqualified men throughout the country might be traced to the ignorance which existed amongst the vast majority of their fellow-countrymen in regard to the duties and qualifications of an architect. He was not sure that that ignorance prevailed to the same extent in

England, but in Ireland, and more particularly in the country districts, the very nature of an architect's work was enshrouded in mystery. Was it any wonder that whilst such ignorance existed it should appear to most people an unnecessary extravagance to employ an architect when there were so many builders to be found ready to prepare the drawings free of cost? What would be the opinion of those who came after them concerning the culture of this age if they were judged by the standard of art as reflected in the buildings which were being erected by the county and rural councils, or, to go even a step lower, by most of the cottages which were being constructed in such wholesale fashion under the provisions of the new Labourers (Ireland) Act? That Act, to which reference had been made in the annual report, would have, he feared, far-reaching consequences inimical to their profession, and as a natural corollary, inimical also to the public interest. They had heard how the Local Government Board received a strong protest made by their Council.

Mr. Birrell's Attitude.

Mr. Birrell, in a letter to the Council, stated that he fully agreed in the view expressed by the Local Government Board, namely, that the architectural work in connection with the erection of these cottages was not such as to require specialised knowledge, and that the Bill was accordingly framed so as to admit of the employment of persons who were not qualified architects. The result of that unwise policy would undoubtedly be that every person appointed under that Act to supervise the erection of these labourers' cottages would thenceforward consider himself entitled to take rank as a fully-qualified architect. This was a very serious state of things.

The Architect and the "C.E."

Until the public was brought to recognise that the diplomas conferred by the R.I.B.A., and by those societies which, like their own, were in alliance with it, were the only standard of professional proficiency on which the public could place any reliance, apart from the personal reputation of the architect, until the public was able to discriminate between these diplomas and the spurious titles, they would have to suffer the rivalry of the unqualified "C.E." It might be asked were these diplomas any real guarantee that those who held them were possessed in any degree of the divine gift of artistic design, or of architectural ability? Did they, in fact, do more than show forth to the public that their possessors were members of a trade union? These were hard questions, and if they would be honest with themselves they must admit that the standard of technical proficiency on which their diploma was conferred had hitherto been fixed less with the view to enable the public to distinguish between the real architect and his counterfeit, than with the object of enlisting within the ranks of the profession every person who, having entered it through recognised channels, had passed the prescribed period in the study or practice of architecture, but with little, if any, regard to the knowledge he had acquired during those years. It was this consideration, supported, as it was, by the urgent request of the Architectural Association that they should supply some incentive to its members to pursue the systematic course of study provided for them, which influenced that Institute in its decision to form a student class of membership, candidates for admission to which would be required to pass an examination in architecture equal to, and accepted in lieu of, the "Intermediate" examination of the R.I.B.A.

Now, by establishing that examination and by determining that after a certain date, which had yet to be fixed, members should be recruited solely from the studentship class, this Institute had embarked on a course which would, if successful, remedy some at least of the evils to which he had referred. But they must face the fact that the way of success lay through registration, and he regarded the recent decision of this Institute as the first definite step in that direction. He felt that there existed in Ireland a pressing necessity for the protection which would be provided in a measure for the statutory qualification of architects.

The annual dinner of the Institute was subsequently held.

HOUSE AT LETCHWORTH. AYLWIN O. CAVE, ARCHITECT.

This house was erected at a cost of £187, including fees at 5 per cent. The architect was Mr. Aylwin O. Cave, of 29, John Street, Bedford Row, W.C., and Norton Way N., Letchworth, Hitchin.

WREN'S WORK IN THE CITY.

At the meeting of the Architectural Association held on December 20th a paper by Mr. Arthur Keen, F.R.I.B.A., on the churches built in Classic manner by Sir Christopher Wren in the City of London, was read. The following is a summary of the paper:—

Wren built 49 churches in the City, besides repairing or adding to others. At the present time, 18 have disappeared, 3 having been destroyed within the past ten years. This year the Church of St. Peter-le-Poer, not, it is true, built by Wren, has been sold and demolished; and, although it was not a fine church, its loss is to be regretted because it was the only instance in London of a church lighted entirely from the top. It was a circular church with a domed ceiling springing off a continuous cornice, and having a circular eye at the top with a lantern over it. The light was beautifully diffused and the effect was altogether good.

Wren's Versatility and Invention.

Now, it is well known that Wren's churches were built mostly on the sites and often on the actual foundations of earlier Gothic churches—such churches, for instance, as St. Olave's, Hart Street; St. Helen's or St. Giles's, Cripplegate; some of the few that survived the fire—and this fact throws into greater prominence the wonderful power of invention displayed by the architect. His work was that of a pioneer—a new departure entirely. For, although the Classic manner had become general by this time, it must be remembered that the church of St. Catherine Cree, built by his immediate predecessor, Inigo Jones, was in all essentials a Gothic church, and that even such Gothic work as the fan tracery vaulting over the staircase of Christ Church, Oxford, was possible in Charles I.'s reign (1640).

The great point that strikes one is that all these churches of Wren's, new and original as they were, show no uncertainty or hesitation, and the variety of types that they illustrate is quite extraordinary, whatever standpoint they are regarded from.

Of course, it has to be remembered that Wren went to France the year before the Fire of London, and saw work by Bernini and other Classic men; but his originality is remarkable enough even in face of this. And it may be pointed out that the building in Paris that is most like Wren's work—the Hotel des Invalides—was not begun until five years after Wren's visit, and neither S. Sulpice nor the Pantheon was built.

A Short Classification.

Now, as to the scheme of general arrangement of the churches, regarded as interiors rather than exteriors. They comprise buildings of all sizes from about 76 ft. by 40ft. (St. Matthew, Friday Street) up to about 144ft. by 90ft. (Christ Church, Newgate), and many types of plan, from the simple oblong without a column or recess up to the full three-aisled example like St. Peter's, Cornhill, or the many-columned St. Stephen's, Walbrook; some with galleries, some without, and some with chancels more or less after the Gothic fashion, but mostly without.

The various churches may be divided into classes according to the arrangement of their ground plans, or by reference to the treatment of their vaulting—or rather of their ceilings, for the vaults are formed in plaster. Taking the ground plans first, it is to be noted that there are

hardly any instances where the tower enters into the architectural treatment of the interior; perhaps the only one left is St. Martin's, Ludgate Hill, and even there it forms merely one of a series of three great arched openings that occur along the south side of the church. Generally, the tower is used either as an entrance lobby, or vestry, and if it comes within the main walls of the church it shares with an organ recess, and perhaps a staircase, a strip taken off from the main area and having little connexion with the design of the rest, as at St. Swithun's.

The simplest form of plan is that which shows in the interior a mere oblong without columns or recesses, such as St. Mildred's, Bread Street; or St. Nicholas Cole Abbey. Then there is a similar plan with the addition of a recess, such as St. Clement, Eastcheap. Then the same form of a fully developed aisle, like St. Margaret, Lothbury, or St. Vedast. And next, of course, the central nave and two aisles, either with or without clearstory windows—a good form of church where galleries are wanted, but treated very successfully by Wren in both ways. St. Andrew Wardrobe and St. Magnus the Martyr are good examples (or St. Bride's). Then we have the square or approximate square with an inside square formed of four columns—a very interesting class. And lastly we get the domed church in various forms: the dome springing off the walls or off columns, or in the orthodox fashion by means of pendentives over the angles of a square or octagon.

In all these classes there is endless change in the use of ordinary architectural forms: simple columns carrying entablatures, columns carrying arches, columns with arches between them, piers carrying galleries and running up to form a nave arcade, and other combinations. St. Bride's is a very beautiful and fully-developed example, and St. Martin's, with its three great deep arches and its beautiful columns and entablatures, is another. Of

the Domed Plans

the noblest, of course, is St. Stephen's, Walbrook, and one need never be weary of studying and admiring the skill on the one hand and the instinct for beauty on the other with which this interior is managed. Among other things this church illustrates well a striking and interesting characteristic of Wren's interiors—their extreme picturesqueness. The freedom of treatment, the breadth of light and shade, the boldness and dignity of the essential parts, and the general interest of the composition, together with the beauty of the carved and moulded oak work, the quaintness and charm of the old brass chandeliers and iron sword rests, the touches of gold on stone and plaster, all combine to produce delightful subjects for a painter. It is opportune to point out here

one great element of difference

between Wren's work and much of even the best of modern work, namely, the way in which he treated walls in broad unbroken surfaces. He made but little use of pilasters, engaged columns, panels, rusticated quoins, and other devices by which wall surfaces are commonly "relieved" and spoilt nowadays. The Gothic revival with its buttresses and ribs, its wall shafts and panelling, has left the modern race of architects with an uneasy feeling that every division of a building should be expressed on its outer walls, and every feature occurring high up should grow out of something below, so that many breaks and projections and ornamental details possessing very little reference to construction or even to intelligent design appear on the outsides of their walls to the destruction of all breadth and dignity. In fact, the tendency is to over-design buildings—which is a thing that Sir Christopher Wren never did. He was content to leave a good thing alone without attempting to make it better; and none of his buildings give the impression that he regarded them as his last or even, perhaps, his only chance of distinguishing himself!

Wren's Ceilings.

Now, as regards the design of the ceilings for these churches, let us start by accepting three leading classes—the flat ceiling, the vaulted ceiling, and the dome. Of the first kind we have St. Nicholas Cole Abbey (1677) as a good example of a ceiling divided into panels by beams crossing each other. Then we may take St. James's Garlick Hythe as an example of the flat ceiling with a cove round it, and this church shows the cove in its most highly-developed form, divided up into a series of groined openings over the window heads, and with barrel-vaults over the wide centre bay cutting into the cove and forming a sort of transepts.

St. Vedast's Church, close to the General Post Office, is another good example of a coved ceiling, and it has some finely-modelled plaster work in bold relief introduced in the mouldings of the cove and the ceiling panelling.

I almost hesitate to offer St. Peter's, Cornhill, as an illustration of the type of church with a great unbroken barrel-vault from end to end of the nave, because the church has been recently decorated in such a way as to take much of the dignity out of it, and to contradict the general lines of the scheme. The decorator seems to have been actuated by the single idea of separating each particular detail from its surroundings, so that every moulding and panel, archivolt, rib, and corbel is a different colour from the ground on which it is seen, and the architect's design is cut up into strips and patches of colour. However, leaving the present colouring out of the question, the whole church stands as a fine architectural conception, and an excellent one for a modern designer to base his studies on.

St. Mary-le-Bow is an interior that approximates to the last in its general treatment, but it has vaults cutting into the main barrel. St. James's, Piccadilly, although not in the City, is another.

As a very fine example of a three-aisled church with a great barrel-ceiling over the nave, we may take St. Andrew Wardrobe—in my judgment a fine interior in every way and a good example of the use of galleries. The two churches of St. Anne and St. Agnes and St. Martin, Ludgate Hill, are both of them fine examples—one wide and low, and the other narrow and lofty—both of them with flat ceilings in the corners, and segmental vaults intersecting over the crossing. Another church of the same class is St. Mary-at-Hill, Billingsgate. It is of the Greek cross plan in its purest form—that is to say, with a well-defined square in the centre covered by a dome on pendentives. When allowance is made for the use to which this church is put by the Church Army with its magic-lantern sheets, gramophones, band, teacups, and other accessories of popular religion, it must be felt to be

one of the Most Beautiful Buildings in London.

Before we come to the more elaborate of the domed churches, there is one church to be mentioned as a kind of intermediate treatment, a very beautiful one, although quite small. This is St. Mildred's, Bread Street, already alluded to as having the simplest possible plan, but presenting a beautiful interior. It has a flat dome in the centre of its length, of the full width of the church, 36ft., carried on four pendentives contained between four arches forming the central square; wall arches to the north and south, and actual vaults to the east and west, carried on corbels and arches so as to dispense with a continuous cornice—which would have been an awkward feature to deal with on account of the high windows. Almost everything in the church is interesting and well designed—pulpit, reredos, font, chandeliers, and some good ironwork and wall tablets. The lead spire, too, is a good example. All the plasterwork is treated in the usual bold masterly fashion, effective, in spite of the doubtful light of the City, and contributing very well to the scale adopted. It may be pointed out that the freedom of the plaster detail in these churches of Wren's is very valuable in masking the irregular spacing and unequal angles that arise out of the awkward shape of the sites in many cases.

Wren has been called the last of the Gothic architects—in consequence of his versatility and imagination in design—and the Gothic spirit shows itself also in the calm indifference shown in St. Swithun's and many other churches to the laws which govern the development and intersection of curves.

Our Great Heritage.

There are many more churches to which reference might be made, but we have now dealt with a fairly representative selection of them, and I hope sufficiently interesting ones to show that these churches of Sir Christopher Wren's are valuable enough as architectural monuments for the most jealous care to be exercised in the preservation of them from injury or destruction. The plea that they are little used, and that for the price of one it is possible to build three or four useful churches in the suburbs, is an utterly unworthy one.

I have no doubt we could extinguish the rates of London for ever by letting Hyde Park in building plots, or we could finance a missionary society by selling the Crown jewels. There is no limit to the destruction that may be done if the merely utilitarian principle is admitted. The people who built these churches had been weakened and impoverished by civil war, by plague and fire, and they were in constant danger from their enemies across the sea, and yet they made the sacrifice that was required to build them. If their descendants in the modern London suburbs want churches, let them pay for them themselves or show their richer brethren good reason for doing so. They have no right to rob an historic city of the memorials of those who made it great, no right to destroy the beauty they cannot replace, and no right to deprive those who do use them, for there are very many who day by day come into these churches to say their prayers and to rest and meditate, out of the worry and hurry of City life.

SOME NOTES ON WREN'S CHURCHES BY MR. PHILIP NORMAN.

Following the reading of Mr. Keen's paper, some notes by Mr. Philip Norman on "Wren's City Churches" were read by Mr. C. Wontner Smith. After referring to Wren's plan for the rebuilding of the City after the Great Fire of 1666, Mr. Norman said: "Living at a time when the princi-

ples of Gothic architecture had completely died out, Wren accepted the Classic Orders, but from them he evolved more or less a style of his own—suitable for the requirements of the time and climate—which is most distinctly marked in all his works. It is in this originality, this power of adapting himself to circumstances, that he diverges from his great predecessor Inigo Jones, who had studied in Italy (Wren never going beyond France), and who had more completely assimilated the teachings of Vitruvius and the example of Palladio. Helped by his knowledge of mathematics and geometry, he was also a most skilful constructor. His churches were made for Protestant worship as it was understood in his day. . . .

"Sir Christopher started with no school of artists or craftsmen to help him in the details of his buildings. However, as time went on, he gathered together round him such capable men as Strong the master-mason, Jennings the carpenter, Tijou the metal worker, Grinling Gibbons who created quite a school of English carving, Sir James Thornhill, and others, so that he could use appropriate embellishment as far as the means at his disposal would allow.

"Following the example set him in the mediaeval City churches, he seldom built constructional chancels, but usually formed a quasi-chancel by a low carved screen standing upon the pews, which in some sort represented the ancient rood loft. At All Hallows the Great and St. Peter's, Cornhill, there were more important screens. Pews and galleries, when occurring in the ancient churches, had been usually of the nature of added excrescences, but both formed an integral part of Wren's design; for although in a letter printed in the Parentalia he said that he would have preferred benches to pews, for valid reasons which are there given, he followed the then existing fashion. The organ, when introduced, was enclosed in a handsome case, and was placed in a gallery at the west end, also occupied by the choir. The pulpits were finely carved, and with their large sounding-boards looked very important. At the east end was a high carved oak altar-piece, usually surmounted by the Royal Arms and flanked by the Lord's Prayer, the Creed, the Ten Commandments, and by paintings of Moses and Aaron. The fonts were small basin-shaped vases supported on baluster shafts, and having, as a rule, a well-carved oaken cover.

"Inside, alas! these great works of our great Protestant architect have most of them been terribly falsified by a succession of ignorant and tasteless alterations. A common defect with the 'restored' Wren churches is that by the addition of deeply-coloured glass—often also by the blocking of windows—they have become extremely dark, so that it is necessary to be always using gas or electric light, the former most destructive of masonry. Upon a careful study, the rectangular lead lines of Wren's glazing, at first sight a trivial detail, will be found an essential element of his design. The injury therefore done to the churches by the introduction of stained glass having irregular leading cannot be over-estimated. The introduction of machine-made tiles, and of gas standards of pseudo-Gothic design, may also be mentioned among the abominations which have disfigured Wren's churches. It is only by visiting a succession of them and by piecing together what one sees that it is possible to conjure up in the 'mind's eye' their probable appearance as he left them.

"The churches of the City of London are gradually succumbing to changed conditions, and the utilitarian tendencies of the present day. Eighteen of Wren's beautiful buildings have already been destroyed, besides several of later date. The first to disappear was St. Christopher-le-stocks, when the Bank of England was enlarged in 1781. St. Michael, Crooked Lane, was swallowed up in the approaches to New London Bridge in 1841. St. Bartholomew by the Exchange made way for the Sun Fire Office, and shortly afterwards St. Benet Fink was taken down on account of its proximity to the present Royal Exchange. Since the passing of the Union of City Benefices Act in 1860, fourteen churches designed by Wren have succumbed, and attacks on others are with difficulty warded off. It is earnestly to be hoped that the public mind is now awakened to the value of Wren's masterpieces and that we shall endeavour to preserve every stone of his work that remains."

A vote of thanks was proposed by Mr. A. E. Moore, who thought that future decorators of the City churches might profit much by reading Mr. Keen's remarks. Mr. Phillimore seconded. In supporting the vote of thanks, Mr. H. H. Statham thought that much was to be learned by studying Wren's planning, but, as to detail and enrichment, he considered that Wren was not responsible to any great extent. Mr. Flint Clarkson and Mr. Walter Millard also spoke. Mr. Walter Cave summed up, and the meeting terminated.

THE ARCHITECTS' TECHNICAL BUREAU.

Through the courtesy of the Editor of THE BUILDERS' JOURNAL, we are glad to have this opportunity of drawing the attention of the architectural profession to the establishment of an Architects' Technical Bureau.

We believe there are many among us who, for a long time past, have felt the want of such an institution, and the reason is not far to seek when one recalls the immense advancement that has taken place in building methods during recent years. Simultaneously with this development is a proportionate increase in the responsibility and liability of architects, who, as a conscientious professional body, cannot afford to be without ready means for acquiring the disinterested information which it is hoped to provide through the medium of this Bureau.

Architects are generally regarded by manufacturers as being too conservative in their ideas and methods, and one hears on all sides of the extreme difficulty that is often experienced in bringing any innovation, however desirable and useful it may be, under the personal notice of members of the profession. If manufacturers knew how inundated architects are with circulars, trade lists, and so forth, they would not be surprised that they sometimes turn a deaf ear to manufacturers' proposals for personal interviews.

One remedy is to centralise all catalogues, pamphlets, and circulars; to have them carefully classified and tabulated, so that an architect who requires any special information can obtain it from a central office. This facility the Bureau proposes to offer to its subscribers, and, wherever practicable, in order to make this information still more useful, it is suggested that tests and reports made by various experts upon building specialities should be prepared from time to time.

By this means it is believed confidence will be readily established, and progress greatly assisted.

Apart from these reports, how deplorable is the waste of time incurred in searching through catalogues for some particular information that is required, which, when eventually found, is often obsolete! Manufacturers cannot always keep up-to-date the catalogues they issue, if only for the reason that the cost of materials, etc., fluctuates, but a central office can readily be kept *au courant* with the rise and fall of prices. Then, again, it appears that it would be most desirable for architects to be able to ascertain from some office the location, size and character of the buildings already erected in which the materials or fittings, as the case may be, that they are proposing to use, have been employed. It is the intention of the Bureau (with the permission of the respective architects) to make records of the firms supplying the materials and fittings for the various prominent buildings throughout the country, as and when erected, and also to give the architect's name, for many architects are quite prepared to repose confidence in the judgment of those of their professional brethren personally known to them who have already used the goods or specialities it is proposed to employ.

It is hoped that architects generally will appreciate the idea that has resulted in the establishment of this Bureau, for though at present there are more than 500 architects already enrolled as subscribers from all parts of the country, yet, as time goes on, an increase of membership will doubtless be desirable.

The Bureau is to be under popular control, the Committee being elected from the subscribers, and the strictest impartiality will be observed throughout.

Advisory Committee:

GEO. BERTRAM BULMER, F.R.I.B.A. (Leeds).
ALFRED W. S. CROSS, M.A., F.R.I.B.A. (London).
JOSEPH CROUCH (Birmingham).
H. L. GODDARD, M.A., F.R.I.B.A. (Leicester).
GEORGE HUBBARD, F.S.A., F.R.I.B.A. (London).
PAUL OGDEN, F.R.I.B.A. (Manchester).
WILLIAM A. PITE, F.R.I.B.A. (London).
H. D. SEARLES-WOOD, F.R.I.B.A. (London).
EDWIN SEWARD, F.R.I.B.A. (Cardiff).
KEITH D. YOUNG, F.R.I.B.A. (London).

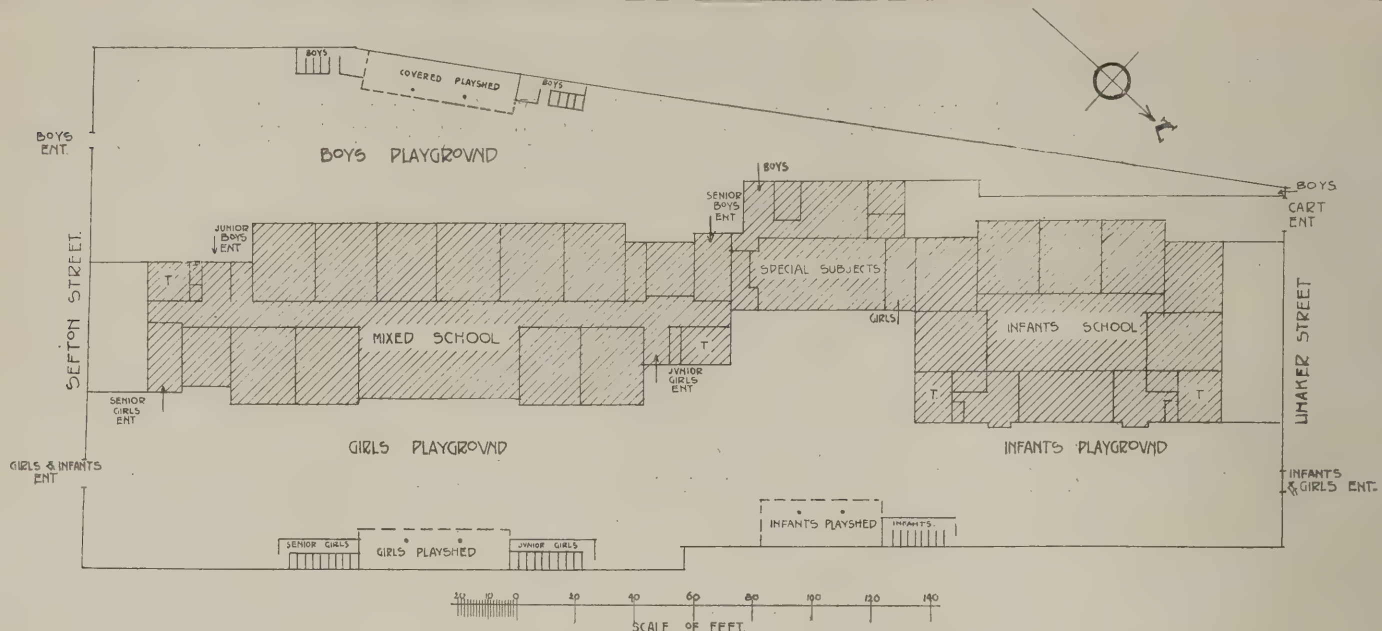
All communications to be addressed to the secretary, at the offices, 11, Bloomsbury Mansions, Hart Street, London, W.C.

Our Plate.

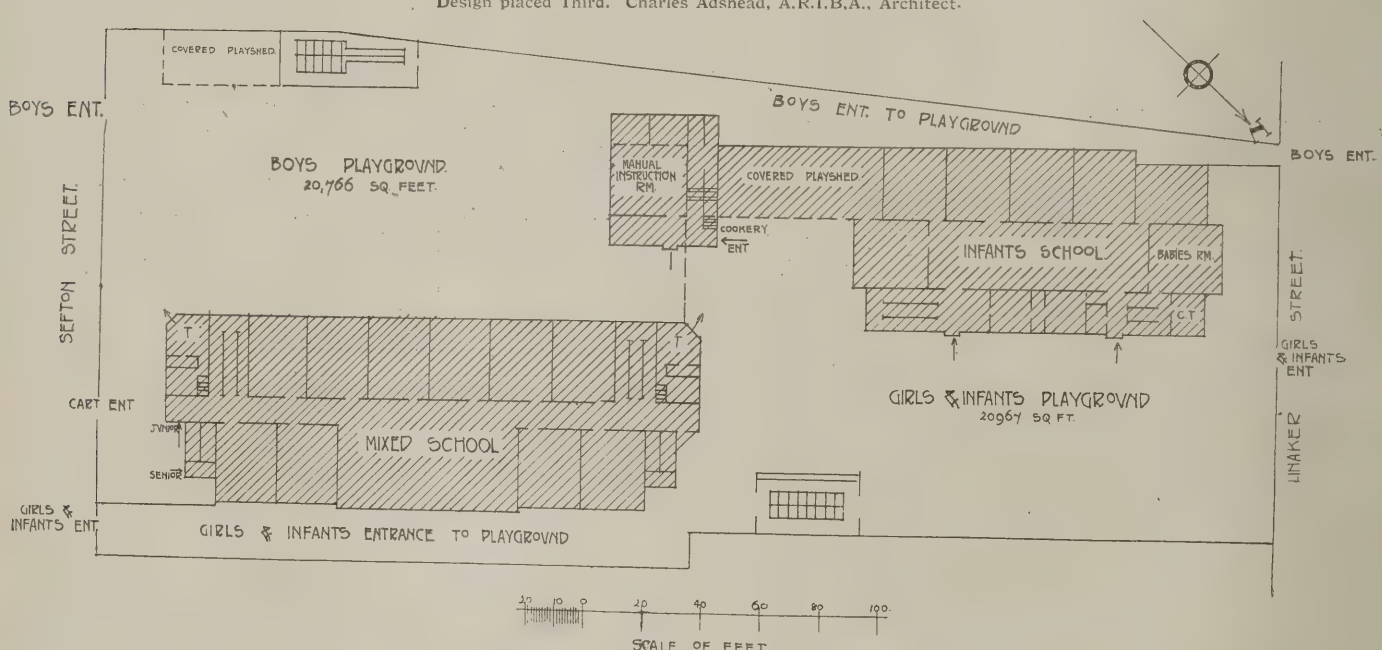
Design for a Hospital.

The design for a hospital which we illustrate this week is the work of a well-known architect who, for certain personal reasons, does not wish to disclose his name at the moment. The scheme is a very interesting one. The facade of the building is treated in a dignified and broad manner, and at once shows the hand of a capable designer. The original drawing from which our reproduction was made is a fine water-colour by a clever draughtsman.

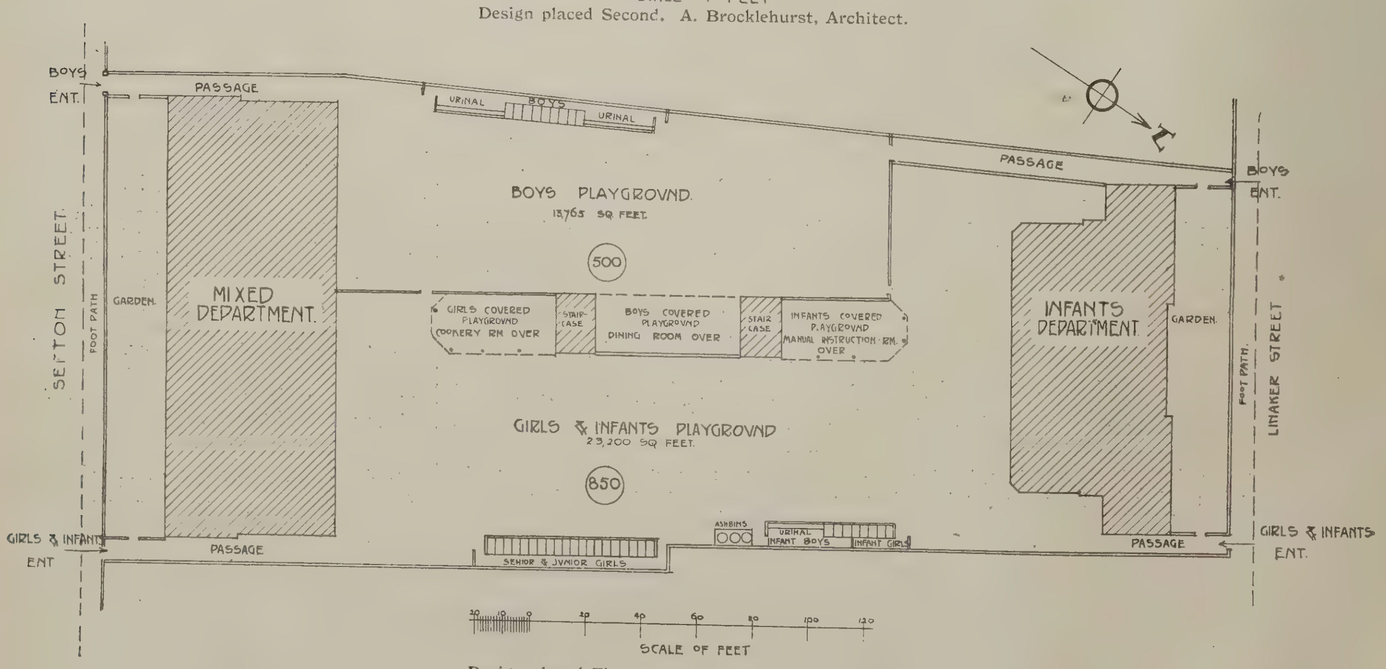
The Lancashire Asylums Board have just decided to make their own bricks on the site of the new asylum at Whalley, and to apply to the Local Government Board for leave to borrow £12,000 on the brickmaking account. Alderman Scott Barrett estimates that a probable saving of £6,000 or £7,000 will be effected, and Mr. Littler, the architect, says there is sufficient good clay at Whalley to make 60,000,000 bricks.



Design placed Third. Charles Adshead, A.R.I.B.A., Architect.



Design placed Second. A. Brocklehurst, Architect.



Design placed First. Cheers and Smith, Architects.

ELEMENTARY SCHOOL, SOUTHPORT: BLOCK PLANS OF PREMIATED DESIGNS.

SOUTHPORT ELEMENTARY SCHOOL COMPETITION.

The 68 designs submitted in this competition have recently been on exhibition at the local art gallery. Mr. S. E. T. Lawrence, F.R.I.B.A., of London, was the assessor. After considering his report, the Education Committee decided to award the premiums; but the appointment of the architects for the scheme is, we understand, in abeyance, owing to a section of the new council objecting to the proposed school, on the ground that it is not required for the district — despite the fact that this is a middle-class residential district, well populated, and near the centre of the borough.

The competition was limited to architects practising in Lancashire; the work submitted, however, cannot be called representative of the best from leading school architects in the County Palatine. The limit of cost, which was ridiculously low—namely, £10 per scholar—doubtless debarred some from competing, as many architects returned the conditions, accompanied by caustic letters on the subject.

A lump sum, amounting to £900, was named for the professional services, and as this included only about 1½ per cent. for the preparation of quantities, the reduction in the fees was an additional deterrent.

After an examination of all the drawings, we agree with the assessor in his selection of the schemes placed first and second, but the selection of the set placed third is not satisfactory, as many superior plans have been passed by.

Site and Conditions.

The Education Committee had evidently few sites to select from, as the ground ultimately sold to them for the proposed school includes 14 semi-detached houses, with front and back gardens. Entrances to the school could only be placed in Sefton and Linaker Streets, facing almost north and south. The east and west aspects are occupied by boundary walls, separating the school playgrounds from adjoining land and property. (The former is liable to be built upon in the future, and this would interfere with the lighting of the school if placed near the surrounding walls.)

Accommodation had to be provided for 1,000 scholars in the mixed department, and 350 in the infants' school. The former had to be a two-storeyed building with central halls on each floor; and the latter had to be regarded as a separate school. A room for cookery and laundry, also for manual instruction, with dining hall, and the usual teachers' rooms, completed the chief requirements.

The conditions stated that competitors were to pull down as few of the 14 houses as possible, but in the answers to queries it was mentioned that the Board of Education required all or most of the houses to be taken down, in order to provide the necessary area for playgrounds.

Design Placed First.

This position, with £50 premium, has been awarded to the set of drawings sent in by the well-known school architects, Messrs. Cheers and Smith, of Blackburn. The plans show a cleverly-grouped set of buildings, well disposed on the site, and most compactly arranged. It is noticeable throughout that the authors of this design have carefully considered every detail with a view to securing as ideal a set of plans as the limitations and difficulties of the site would permit. We note particularly the following points:—With a view to ensuring a maximum amount of light and air to each school and playground, advantage has been taken of the Sefton Street frontage for the mixed department, and the Linaker Street frontage for the infants. The entrances are directly approached from the playgrounds, and thus secure more privacy than if placed in the main fronts, seeing that the latter are only a few feet from the street. All the teachers' rooms are conveniently placed so as to command the entrances, latrines and playgrounds. 21 of the 27 classrooms have been so arranged that the sun will get into them during most of the day, and in the remaining six classrooms during some part of the day. The cookery, manual instruction, and dining rooms are placed over the covered playgrounds, and are entirely cut off from the main buildings, so that it is impossible for the smell of cooking to permeate to the classrooms; to these rooms separate approaches (in addition to internal communication) are provided for boys and girls from their respective playgrounds. The conveniences are placed well away from the school buildings; moreover, they are sufficiently separated for boys and girls, and suitable to the several ages of the children. We do not care, however, for the boys' latrines being entered from the other conveniences; it is preferable to have separate entrances for each suite. Objection is also necessary in the case of the girls' latrines, owing to the long range of w.c.'s without a division wall in the centre to prevent this space being abused as a through passage only. A service door for the use of the teachers is shown on the party walls between the classrooms. This feature has been regarded latterly as a nuisance in practice, and, while popular in Lancashire, we believe it is now being omitted in all new schools.

The elevations are the weakest part of this design: they do not express the purpose of the building, and are commonplace in character.

In cube contents this design scores considerably; the mixed department containing 352,830 cub. ft., and the infants' department 117,060 cub. ft.—all taken at 5½d. per cub. ft. The cookery and dining room block contains 66,443 cub. ft. at 4½d. per cub. ft. The total contents of the three departments is 536,333 cub. ft.

Design Placed Second.

The second premium, £30, has been awarded to Mr. A. Brocklehurst, of Manchester. In general arrangement, the block plan follows the lines of most of the schemes submitted, with one difference — the scheme shows the best playgrounds that could be obtained with this disposition of the schools on the site. Unfortunately, the boys have the most sunlight in their playgrounds, and the girls and infants have a north aspect for recreation, and the possibility of the ground being in shadow most of the time, with the infants and mixed departments surrounding them. Both schools are compactly arranged, with the teachers' rooms supervising entrances and playgrounds; but the position allotted to the babies' room in the infants' department is the opposite of ideal, having a north aspect. In securing a through entrance to each school from the adjoining streets much serviceable land has been occupied with long passages, which might have been added to the various playgrounds with advantage, in view of the fact that the site is limited in playground area for the number of scholars which the school has to accommodate.

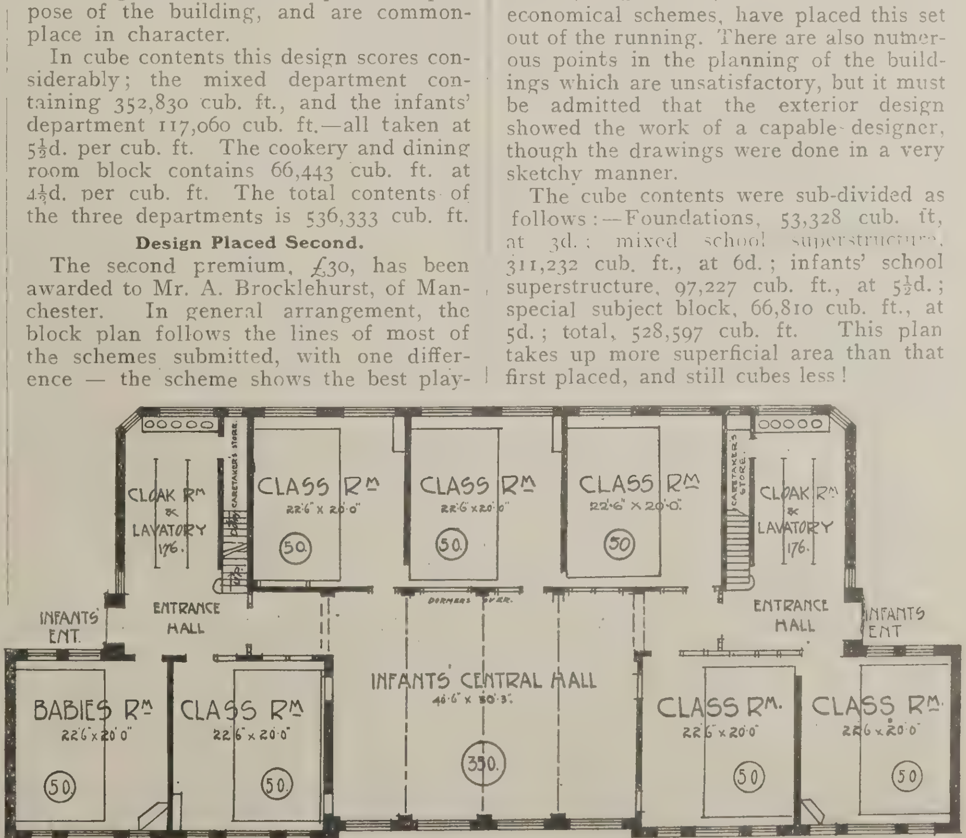
The elevations are superior to those of the scheme placed first, being more architectural in character.

The cube contents are as follows:—Infants' school, 132,112 cub. ft.; mixed school, 368,182 cub. ft.; dining-room block, 85,306 cub. ft.; totalling, 585,600 cub. ft., at 5d. per cub. ft.

Design Placed Third.

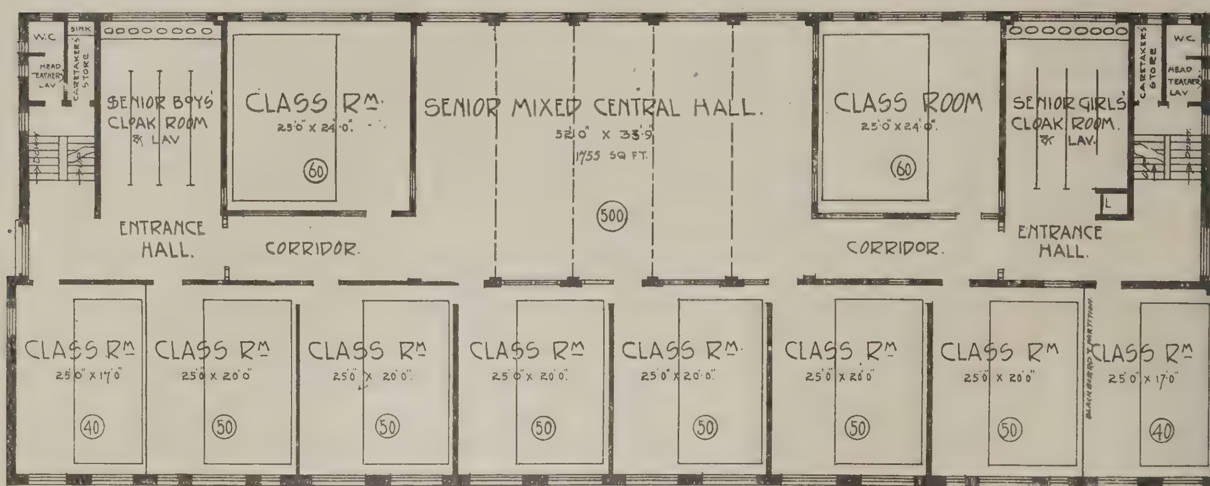
This set, awarded the premium of £15, was submitted by Mr. Charles Adshead, A.R.I.B.A., of Manchester. A glance at the block plan shows a long straggling series of buildings, broken up in outline and occupying the length of the site up to the building line. Playgrounds are very much cut up, particularly the boys' portion, which is practically useless for recreation at the north end, and is in reality a passage. This objection, coupled with the length of corridor in the mixed school, and the large area covered with the special subjects block, has added considerably to the cubic contents of the school, and should, in fairness to more economical schemes, have placed this set out of the running. There are also numerous points in the planning of the buildings which are unsatisfactory, but it must be admitted that the exterior design showed the work of a capable designer, though the drawings were done in a very sketchy manner.

The cube contents were sub-divided as follows:—Foundations, 53,328 cub. ft, at 3d.; mixed school superstructure, 311,232 cub. ft., at 6d.; infants' school superstructure, 97,227 cub. ft., at 5½d.; special subject block, 66,810 cub. ft., at 5d.; total, 528,597 cub. ft. This plan takes up more superficial area than that first placed, and still cubes less!

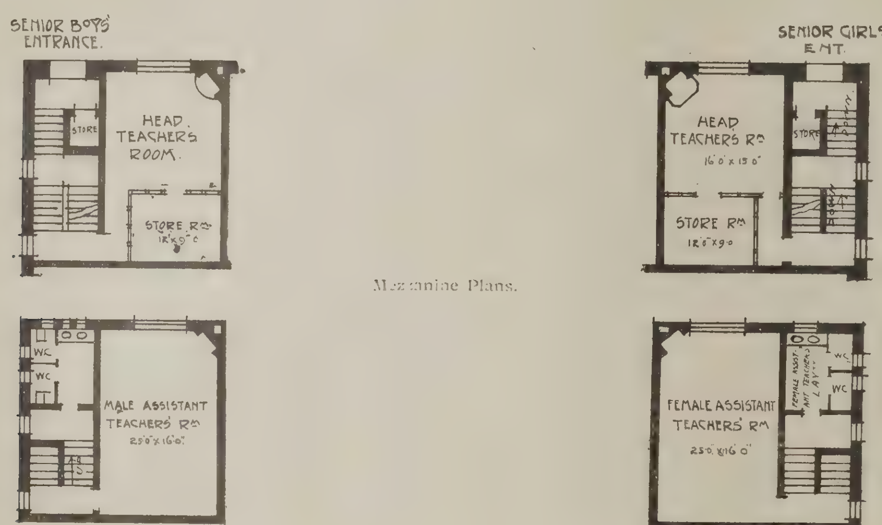


Infants' School: Ground-Floor Plan.

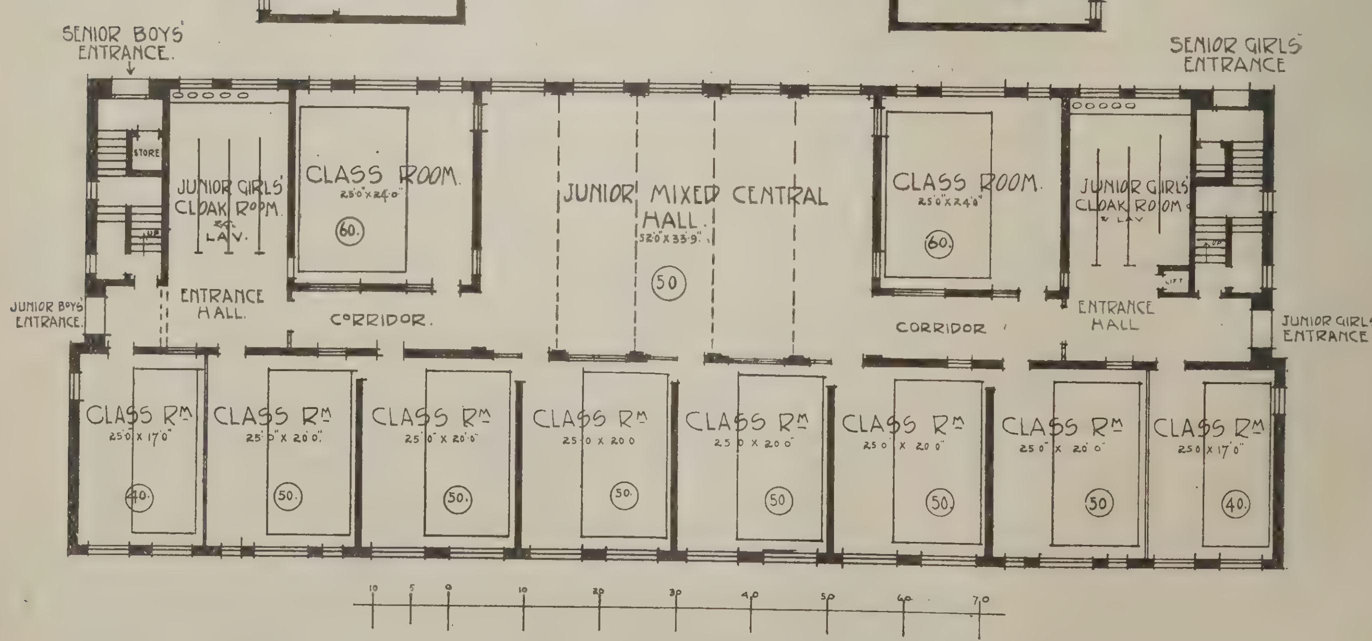
ELEMENTARY SCHOOL, SOUTHPORT: DESIGN PLACED FIRST. CHEERS AND SMITH, ARCHITECTS.



First-Floor Plan.



Mezzanine Plans.



Mixed School: Ground-Floor Plan.

ELEMENTARY SCHOOL, SOUTHPORT: DESIGN PLACED FIRST. CHEERS AND SMITH, ARCHITECTS.

CONCRETE AND STEEL SECTION

(MONTHLY).

FERRO-CONCRETE CONSTRUCTION.

By Henry Adams, M.Inst.C.E., M.I.Mech.E., F.S.I., F.R.San.I., etc.

Examiner in Building Construction to the Board of Education and the Society of Architects.

(Concluded from p. 337, No. 669).

In some of the ferro-concrete floors, the construction takes the form of beams and panels, the reinforcement consisting of rods in both directions through the panels, at right angles to the beams. Fig. 19 shows the plan of a panel, and Fig. 20 a section through a beam with portions of the two adjacent panels. In constructing such a floor, a continuous support has to be provided with troughs where the beams are required; then a layer of concrete is placed in the bottom to form a protection for the rods against fire; then the rods are put in position and the concrete filled in to a short distance from the top, and the upper bars placed in position, when the remainder of the concrete is placed and brought to a smooth surface. This type of construction requires the columns to be not more than 16 feet apart in the two directions, and so causes considerable obstruction to the floor space. To obtain a larger unobstructed area, the type shown in Figs. 21 and 22 is preferable. The main beams run in one direction only, being supported at intervals by ferro-concrete columns or stanchions, and cross beams run in the opposite direction at intervals of say 6 feet. Instead of the rods previously shown, M. Cottancin uses a network of wires for the floor slabs, as shown in Figs. 23 and 24, and stiffens them when the span is large by diagonal ribs, or what he calls "spinal stiffeners," as shown in Fig. 24. Another method by a Hungarian engineer, named Matrai, is shown in Figs. 25 and 26. He likens it to a spider's web but he might have called it a spring mattress. The beams used are ordinary rolled steel joists. The general section in Fig. 27, shows the principle of construction of a boot and shoe factory at Leicester, executed by The Empire Stone Co., Ltd. The reinforcing is done by "indented" bars, the ferro-concrete portion of the structure being designed by The Indented Steel Bar Co., Ltd. The tension rods in the lower side of each beam with the ends bent up to resist shear, and the junctions with the columns, are all clearly shown. Figs. 28 to 31 show very clearly the Hennebique type of construction for columns, and their connection with the floor beams.

Naturally when a building is constructed of ferro-concrete it is desirable to have the subsidiary parts constructed in a similar manner, and hence considerable attention has been given to the formation of staircases. Fig. 32 shows the Hennebique system of construction, the flights being arranged to finish against beams both at the top and bottom, just as a wooden staircase abuts against the joists. Fig. 33 shows the Chaudy system, in which the steps are built out from the

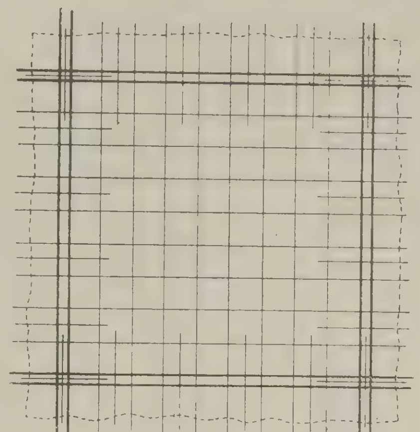


FIG. 19. PLAN CF FLOOR PANEL.

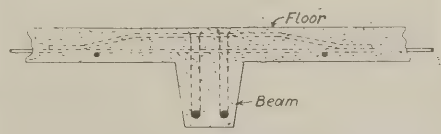


FIG. 20. SECTION THROUGH BEAM AND FLOOR PANELS CF FIG. 19.

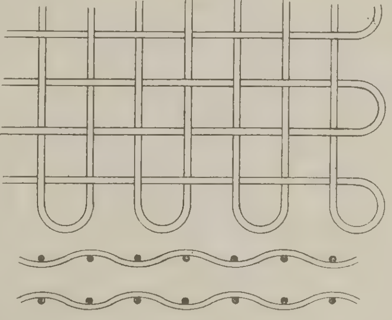


Fig. 23.

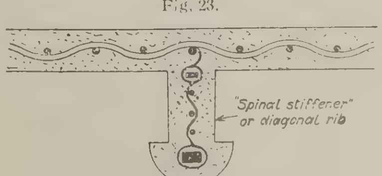


Fig. 24.

THE COTTANCIN SYSTEM.

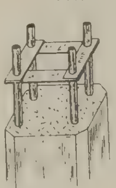


Fig. 28.

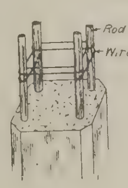


Fig. 29.

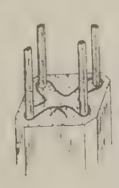


Fig. 30.

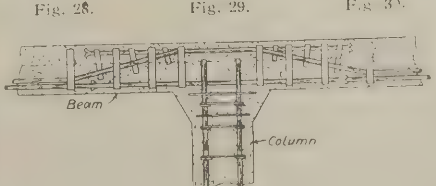


Fig. 31.

COLUMNS AND FLOORS ON THE HENNEBIQUE SYSTEM.

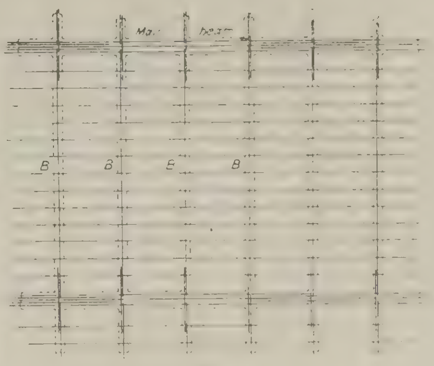


Fig. 21.

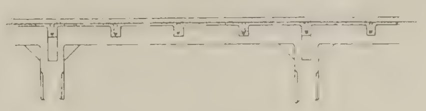


Fig. 22.

PLAN AND SECTION OF FLOOR WITH MAIN AND CROSS GIRDERS.

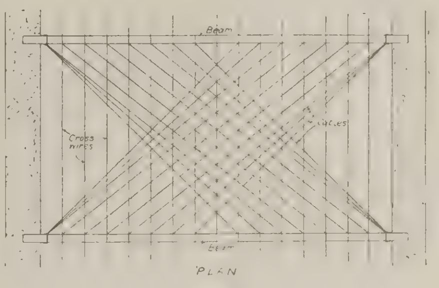


Fig. 25.

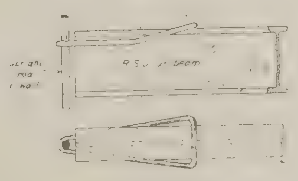


Fig. 26.

THE MATRAI SYSTEM.

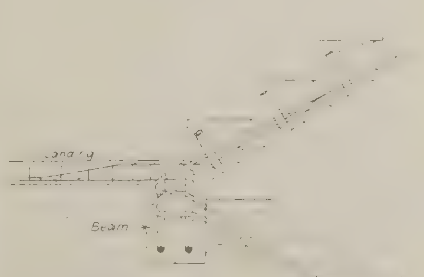


FIG. 32. HENNEBIQUE SYSTEM FOR STAIRS.

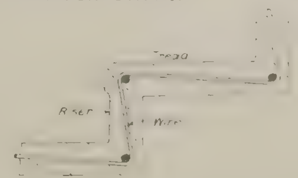
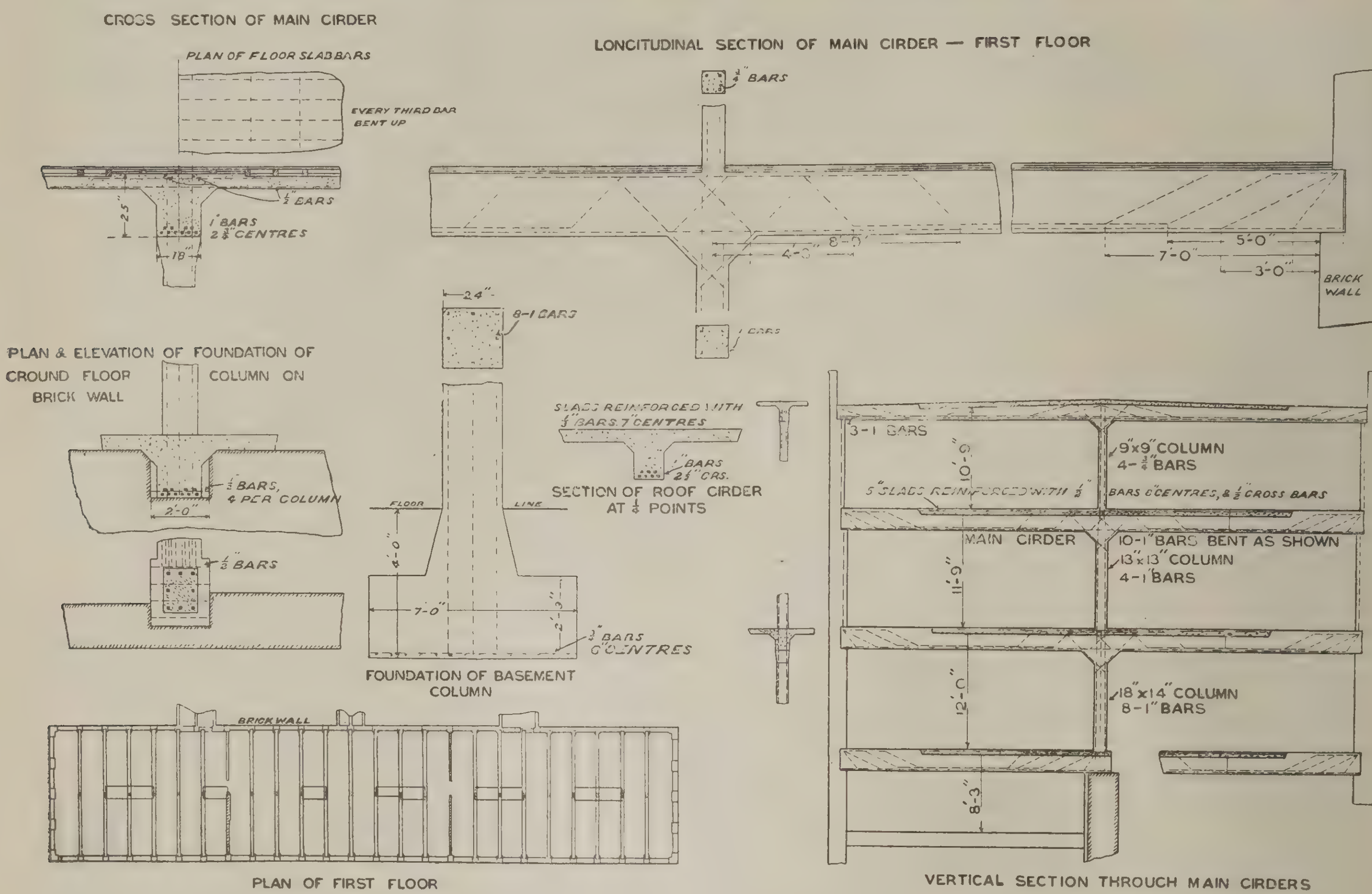


FIG. 33. CHAUDY SYSTEM FOR STAIRS.



FIG, 27. DETAILS OF CONSTRUCTION OF FACTORY AT LEICESTER.

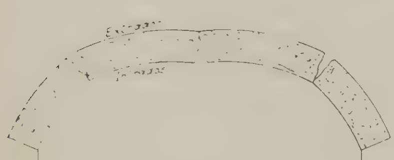


Fig. 34.

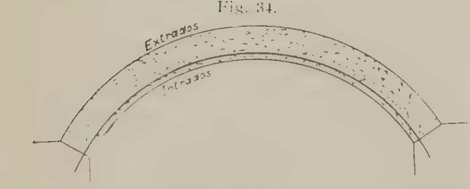


Fig. 35.

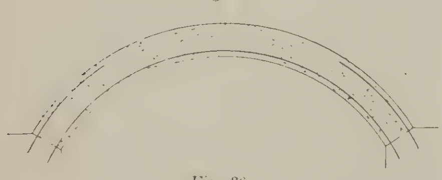


Fig. 36.

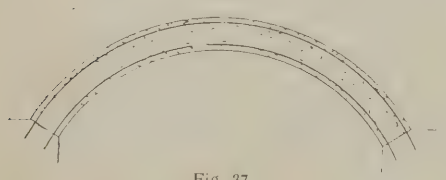
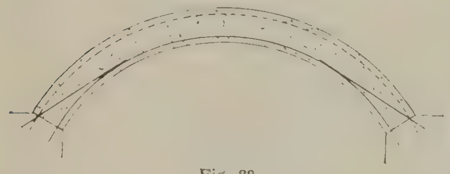


Fig. 37.



Fig, 38,

wall as cantilevers. Fig. 34 shows the general form of failure in an overloaded arch; the crown falls in as the haunches rise, and this should indicate where the reinforcement is usually required for bridges, viz: in the lower part of the thickness at the crown and in the upper part at the haunches. Various forms of simple reinforcement are shown in Figs. 35 to 38. Fig. 39 shows a ferro-concrete bridge carrying a street railway at Marion, Indiana. The interesting feature of this construction lies in the fact that it was designed on the cantilever principle although it will hardly compare in any way with that grand cantilever exposition, the Forth Bridge. It is probably the only attempt at this class of construction in reinforced concrete, of which perhaps architects and artists will be glad. Fig. 40 is a view of Lake Park Bridge, at Milwaukee, with a span of 118 feet, and treated as an arch fixed at the abutments. The bridge was designed to carry a live load of 80lbs. per foot super in addition to its own weight. All the concrete is reinforced with Kahn trussed bars. Fig. 41 shows the reinforced concrete wing walls for the arched bridge at Black Lick, Ohio. The reinforcement is on the inner or tension side of the wall, and the wall is anchored into its foundation. The right hand view shows the simple way in which the set-offs at the back of the wall were formed. Fig. 42 shows a reinforced concrete retaining wall with counterforts, wrongly marked as buttresses. The sort of shelf on the right hand side is held down by the weight of earth upon it and so assists the stability of the wall.

Fig. 43 shows a general view of the Third Madrid Reservoir during construc-

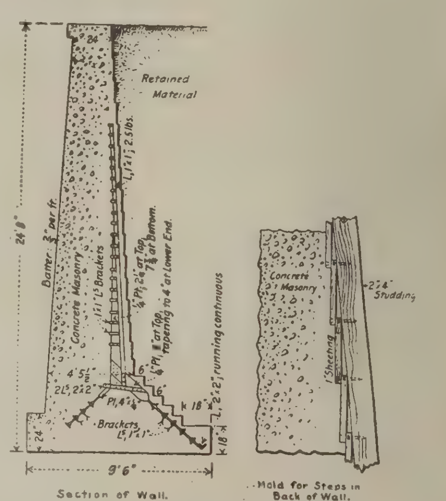


FIG. 41. REINFORCED CONCRETE WING-WALLS FOR ARCH BRIRGE AT BLACK LICK, OHIO.

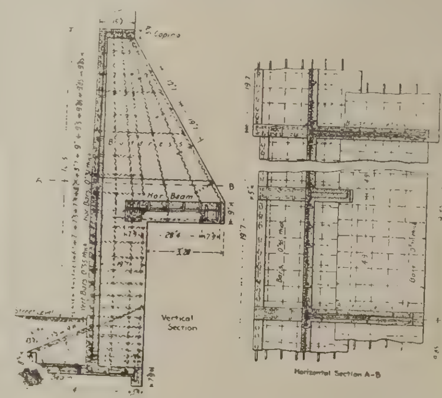


FIG. 42. REINFORCED CONCRETE RETAINING WALL, QUAI DEBILLY, PARIS.

FIG. 39. REINFORCED CONCRETE CANTILEVER BRIDGE FOR STREET RAILWAY AT MARION, INDIANA.

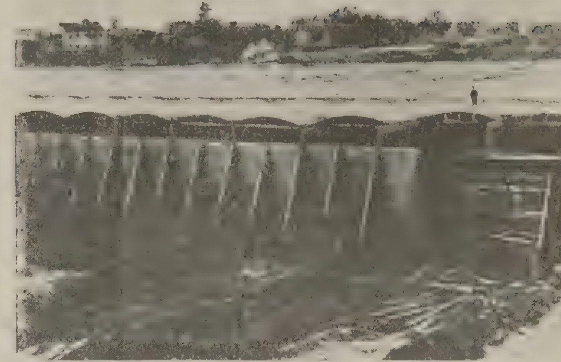


FIG. 43. COVERING OF THE THIRD MADRID RESERVOIR.

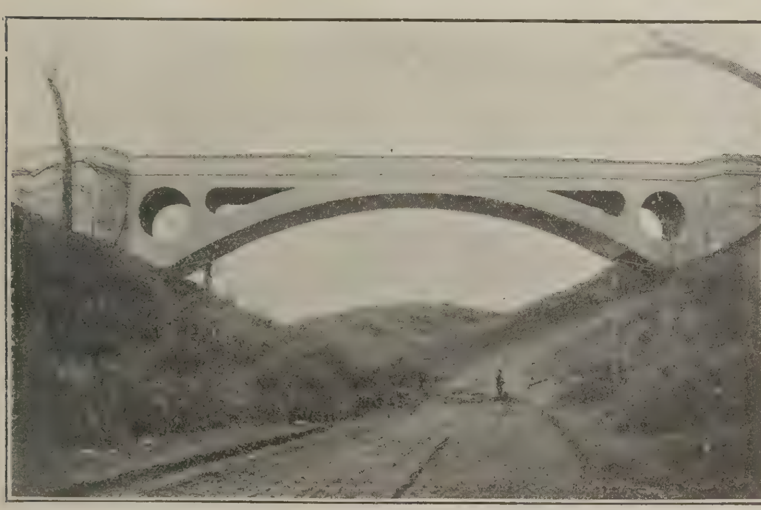


FIG. 40. LAKE PARK BRIDGE, MILWAUKEE.

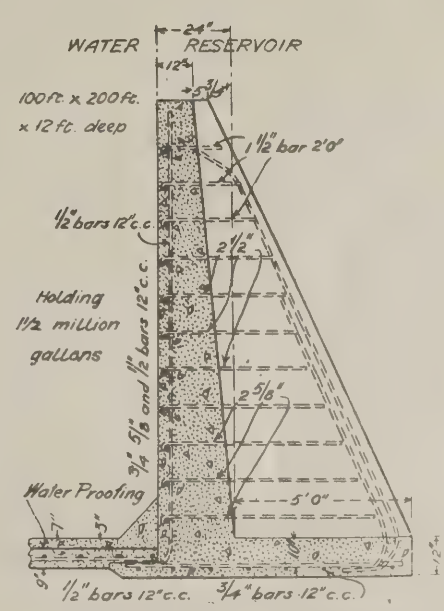


FIG. 44. SECTION OF RESERVOIR WALL.

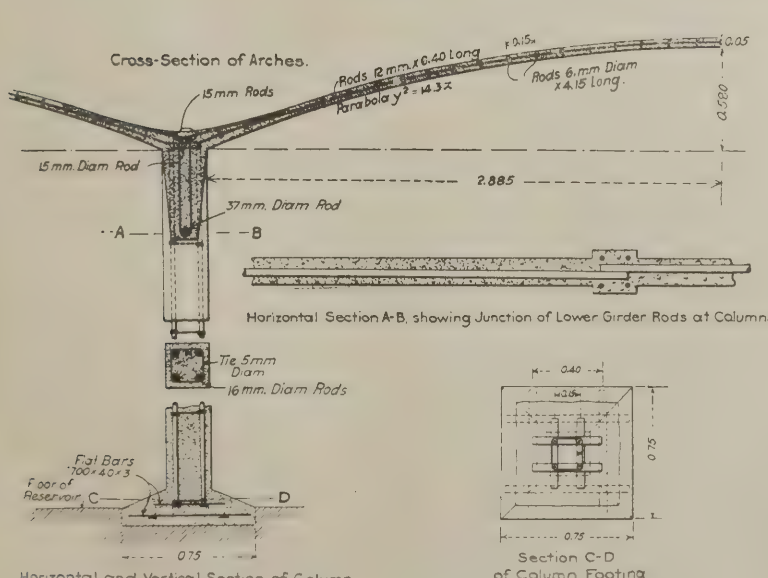


FIG. 46. CONSTRUCTION OF THE THIRD MADRID RESERVOIR.

FIG. 45. COLUMNS AND BEAMS FOR THE ROOF OF THE THIRD MADRID RESERVOIR.

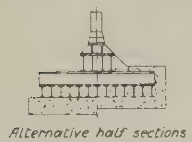


Fig. 47.

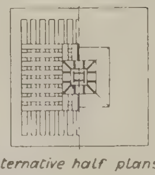


Fig. 48.

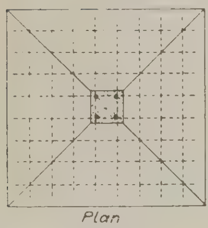


Fig. 50.

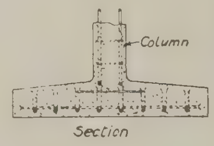


Fig. 49.

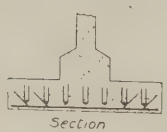


Fig. 51.

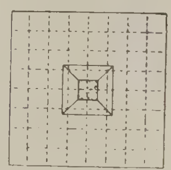


Fig. 52.

Spread Foundations.

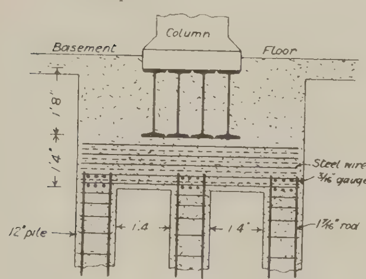


FIG. 54. GROUPING OF PILES UNDER FOUNDATION.

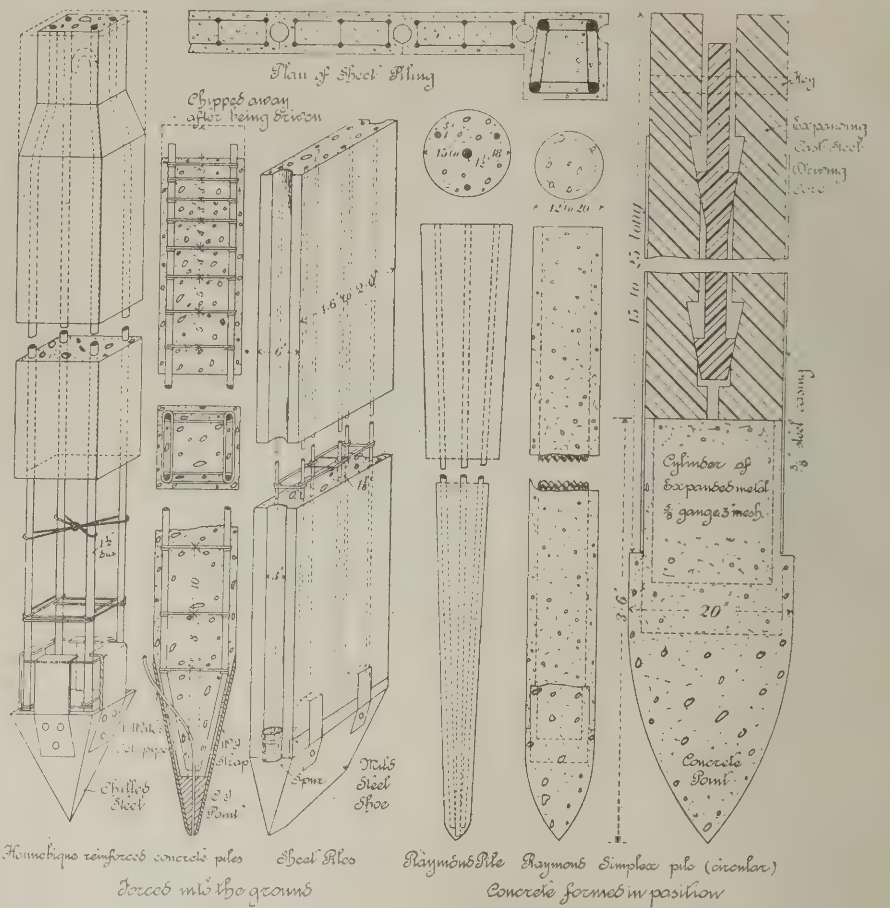


FIG. 53. DETAILS OF REINFORCED CONCRETE PILES.

tion, and it is of exceptional interest owing to the extensive failure that occurred over a portion of the work, when 39 men were killed and 60 injured. It will be seen that the thin outer walls are buttressed to keep them up, the construction of such buttresses being shown on Fig 44, which although not of the same reservoir, is useful as indicating the mode of reinforcing the outer walls and buttresses of reservoirs when built above the surface of the ground. Fig. 45 shows the columns and beams of the Madrid Reservoir, and on the right the first portion of centering for the covering arches. These were intended to be continuous over the whole area which was to contain 106 million gallons. Fig. 46 is from a drawing showing the section through one of the roof beams with portions of two of the covering arches. It would take too long to describe the whole detail of the failure, but it was during the official test. A width of about 13 ft. across all the arches had been loaded with about 2 ft. 6 ins. deep of sand which, however, had been removed, but the next day a general collapse took place. The probable explanation is that the test load was too heavy, that some of the arches

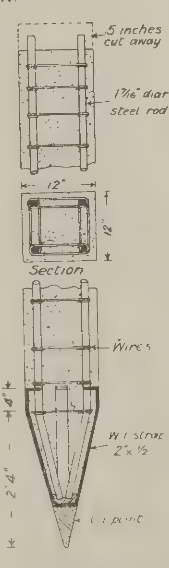


FIG. 55. ONE OF THE PILES.

sank at the crown under the load and the adjoining arches rose, allowing the columns between them to deviate from the perpendicular, when this had occurred the whole thing collapsed like a pack of cards. The security of a building very often depends upon its foundation and ferro-concrete confers not only security but economy in construction. There are two cheif kinds of foundation, in one the area of the foundation is spread out so as to reduce the intensity of pressure, and in the other, piles are carried down to reach

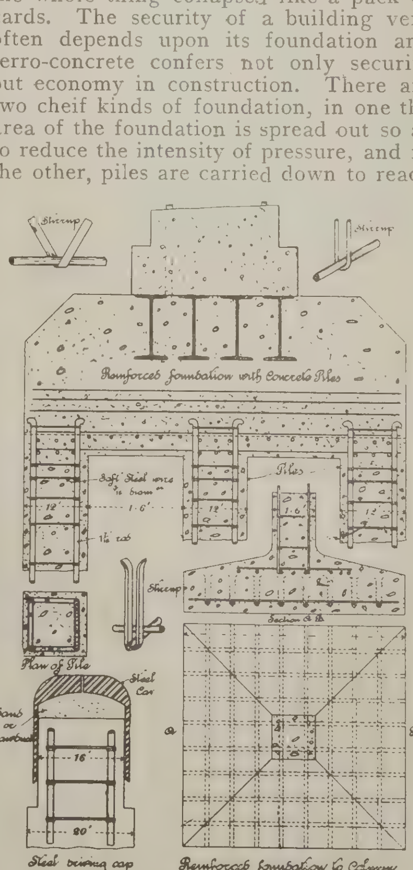


FIG. 56. COLUMN BASES WITH AND WITHOUT PILES.

a firmer substratum. The spreading systems are shown in Figs. 47 to 52; in Figs. 47 and 48 a grillage of rolled joists embedded on or in concrete is shown, and Figs. 49 to 52 illustrate pure ferro-concrete construction. Fig. 53 shows various modes of constructing ferro-concrete piles. Fig. 54 shows the grouping of the concrete piles under columns of a ten-storey building in New York, and Fig. 55 is a detail of the construction of one of the piles. Fig. 56 shows two forms of column bases with and without piling. Figs. 57 and 58 show the details of a sheet pile such as is used in a series to shut in the soil to prevent it from spreading under the weight of a building. The cap used in driving the pile is also shown in Fig. 59.

Before concluding I must express my thanks to the Trussed Concrete Steel Co., Messrs. Balfour and Co., my friend Mr. A. Buchanan, and my late assistant, Mr. Hobbs, for the loan of the illustrations.

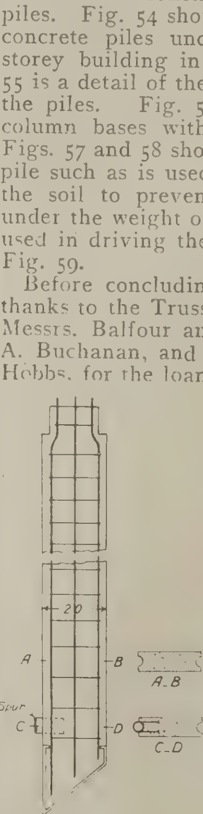


Fig. 57.

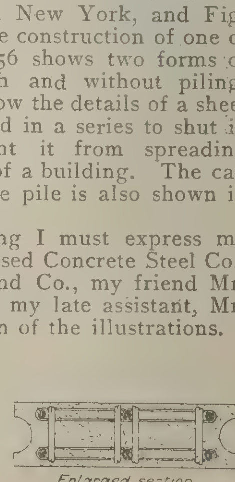


Fig 58.

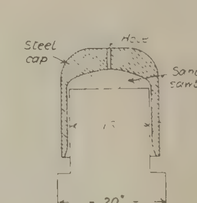


Fig. 59.

FIGS. 57 & 58, DETAILS OF SHEET PILE
FIG. 59. STEEL CAP FOR DRIVING PILE.

SOME NOTES ON HOISTING AND FIXING STEELWORK.

By Alan E. Fletcher, M.S.E.

In view of the apparently growing tendency among builders nowadays to fix their own steelwork whenever possible, instead of having recourse to the constructional firms, it is thought that some few practical notes on the subject may be of service, especially as such work is rather poorly represented in technical literature.

Generally speaking, the cost of erecting ironwork is very much cheaper when carried out by fixers accustomed to the handling of it, and when the work is of such a nature that it can be carried through from start to finish without a stop, as for example in a completely steel-framed building. When, however, brickwork and steelwork have to be carried out simultaneously, the cost of delays (inevitable in the writer's experience and caused by waiting for brickwork in walls and piers, setting of stone templates, etc.) has to be allowed for in the fixing contract and brings it to a higher cost per ton than that for which the builder could fix it.

It is rarely the case in ordinary building practice for the weight of any one piece to exceed five tons, and this weight is within the capacity of a set of differential chain blocks, or perhaps two sets, as it is not usual to find them in the ordinary builder's equipment of a greater capacity than two or three tons.

Although handy for some cases, chain blocks do not compare favourably with crab and tackle for lifting. In the first place their life is usually very short and their efficiency low, except in the case of some of the worm-wheel types, while in jobs where there is much variation in the weights of the pieces they are inconvenient. Also, in cases where the lift is obtained by means of shear legs or derrick pole the weight of chain blocks as compared with rope blocks is disadvantageous, and where the derrick has to be moved any distance, necessitates their being lowered before the moving and rehoisted after it. Added to this their rate of lifting is slow, and lowering the weight and "overhauling" or lowering down the blocks wastes much time.

Single Derrick Pole.

The most convenient tackle for general work where all sorts of weights have to be lifted is without doubt the single pole, two and three sheave blocks and snatch block, and crab winch. The single pole is sooner rigged than shear legs, is more easily raked in any direction, as compared with the double shear legs (which can only be canted in two directions) and is more easily shifted for the next lift owing to its less weight. The selection of a suitable pole to lift a given weight (which should be that of the heaviest piece plus an allowance of 50 per cent as a provision against any accidental surging of the load), is more a matter for experience than calculation. Due attention should be given to its soundness and springiness; the resistance offered to a penknife blade pushed in is a rough-and-ready guide in the hands of the experienced as to the former quality.

Where one pole is not sufficient for the weight, two, or three, with one of the butts at the top, should be used, lashed together at intervals of five or six feet and well wedged. For exceptionally heavy lifts the writer has sometimes found that a request to the local manager of the Telephone Company has resulted in the courteous permission to borrow a suitable pole from the stock on the conditions of carting it and not cutting or damaging it. These poles are purchased under a strict specification, and, as they are passed by experts before being accepted, may safely be taken as being good and reliable timber. Unless a pole be exceptionally heavy for the load lifted, there should always be a certain amount of "whip" or spring in it when loaded, the absence of which shows that the wood has lost its nature, and there is a possibility of its snapping off short under a jerk. A useful formula for the approximate strength of poles used as shear legs is due to Prof. Henry Adams: the safe load in tons being equal to three times the diameters of the butt and top in inches multiplied together, and the result divided by the length plus the rake in feet. This is, of course, intended as an approximate guide, as the actual strength of the poles is dependent as much on their condition as on their size.

To rig the pole a cleat about 12in. long and of stout scantling (4ins. by 4ins., or more, and preferably of hard wood) should be spiked to the pole at the right height, care being taken when calculating the latter to allow for the depths of the blocks when "block and block," the depth of the strop carrying them and the length of the sling; and it is always advisable to have a few feet to spare. If the pole is to be used for any number of hoists, it is better to slightly notch in for the cleat, and it is important that the latter should be stout, as besides carrying the blocks clear of the pole it has to stand severe strains of bending and shearing from the sling chain. The latter is rigged as shown in the sketch (Fig. 1), and where the weights dealt with are heavy it is advisable to put an old cement bag as softening between the chain and the pole and cleat.

The sling chain is middled on the pole and then turns taken round, using up all the chain except just enough of the two ends to hang clear of the cleat. Usually a sling chain has enlarged eyes at the ends, but if a rope sling is used or a chain not provided with hook or eye, a loop-strop must be arranged with a sufficient number of loops to carry the weight and several dry turns round the pole. In either case it is important that the two eyes or the loops should lay level, so that the hook of blocks is bearing properly in all of them. The strain on the strop is the weight lifted plus the pull on the hauling part of fall rope plus the weight of the blocks.

Where shear legs are used they are crossed on some convenient support and lashed with a good scaffold cord, this being middled and a few turns taken round the poles, and one end carried up over and round the cross, and the other down and round the cross. After about eight turns knot them in the middle and tie the ends back to one of the turns with string. The lashing should be tightened with two wedges.

A loop strop is then put on with dry turns round the two poles. The guy ropes are then put on above the strop; for a single pole usually four are required. A small pulley or "jenny" is then made fast to the pole with a light rope rove in it for getting the blocks up, and by means of the guys the pole is up-ended.

When the pole is in position a man is hauled up by means of the "jenny" and line, and the blocks overhauled till there is enough fall rope in them for the top block to be sent up on the same line, the weight of the bottom one not being lifted.

When the blocks are light they can be hooked into the sling chain before uprighting the pole, but if they are large it is not easy to get the pole up or manage it with them on.

A heavy pole is pulled up by means of the crab and one of the guy ropes.

In loose soft ground the butt should be stepped on a short stout plank and "shod" by means of four wood cleats nailed to prevent it slipping, as otherwise the pole sometimes sinks in with the weight, and it may be found that after the sinking there is not enough lift. When lifting heavy work the pole and cleat should be examined occasionally for signs of cutting-in by the chain-strop carrying blocks.

Guy Ropes

should never, if possible, make a less angle with the pole than 45 degrees, as the smaller the angle the less is their resisting power. They should also be arranged with regard to the rake of the pole, so that the whole of the strain is not upon one guy. Four are generally more convenient than three, as it facilitates shifting the pole and minimises the risk of the latter "taking charge" to have it checked in three directions while the fourth rope is being shifted.

To obtain a fixing for the guy ropes, as a rule, presents no difficulty. In solid ground a crowbar driven a foot or two down will hold a good deal. With building work round it is mostly possible to find some doorway or window opening where, by putting a stout piece of scantling across, a good fixing can be got provided the brickwork is not too green.

It is not advisable to make fast round heaps of bricks or material as is sometimes done, because it is difficult to ease away or haul in a guy so fixed, and one of the great differences between builders' fixing and "professional" fixing is the way in which in the latter case the piece is dropped into the exact place by manipulating the guys. Two dry turns round a post and two half hitches round the standing part of the rope, is a secure fixing for a guy rope, and when the hitches are taken off the two turns give secure control of the rope for easing off with any weight. With the free end in the left hand it is fed away slowly, the right hand working the outside turn gently round without a jerk, which is always to be avoided.

To get a fixing for a guy under heavy strain in loose ground, a "shore anchorage" is sometimes useful. Three strong stakes are driven in line about 6ft. apart, one behind the other, leaving about five feet above ground (as Fig. 2). The top of first is tied to the bottom of the second, and the top of that to the bottom of the third (these ropes should be tied taut) and the guy rope is made fast round the bottom of the first stake. All rope fastenings should be examined after rain, and guys should be left slack at night.

Strength and Care of Ropes.

The approximate breaking weight in tons of new hemp rope is equal to the circumference in inches squared and divided by 5. A factor of safety of 5 is desirable and unless the rope is new or known to be in new good condition it is safer to allow a larger margin, since the frequent wetting of a rope impairs its strength without very much altering its appearance. It is very necessary (although a difficult thing in building work) to keep lime away from ropes, and when knocking off work at night the fall rope should be hauled in and coiled and covered with a sack or two.

Before reeving a new rope through the tackle it should be laid out its full length in order to take the turns out, and after the first one or two lifts it will want laying out again, as in passing over the sheaves and stretching it gets a tendency to kink.

Where the diameter of pulleys permits of a wire rope being used, this will be found, especially for heavy lifts, more convenient. They are made in many different steels, and there are wide differences in the breaking weights, so that wherever possible reference should be made to the strength as given by the manufacturers.

The following figures from the list of a reputable firm are average breaking weights, and in default of more precise information will be useful.

Circumference (in inches)	Breaking Weight (in tons)
1	$2\frac{3}{4}$
$1\frac{1}{4}$	$4\frac{3}{4}$
$1\frac{1}{2}$	$6\frac{1}{2}$
2	$11\frac{3}{4}$
$2\frac{1}{2}$	$18\frac{3}{4}$
3	$26\frac{1}{2}$

Wire ropes require more care than hemp. They should be kept well greased and laid out frequently to keep them free from turns. They should not be used over pulleys or sheaves of a less diameter than six times their circumference, or the life of the rope will be considerably shortened. After use they should be laid out and greased before coiling to go back to the store.

Blocks.

Where two and three sheave blocks are used the two-sheave block is the running block and has the end of fall rope fastened to it. The usual fastening is to pass the rope through eye of block, tie a knot, and stop the loose end back on to the rope with a binding of cord.

The gain due to these is 5 to 1, and the strain on any lead of the rope is roughly, allowing for friction, $\frac{1}{4}$ of the load lifted.

Snatch Block.

Special care should be taken to fix this. When the lead of rope to the crab is at right angles to the pole, which is the usual case, the strain on the strop holding the snatch block is about $1\frac{1}{2}$ times the strain in the fall rope, and as the angle decreases the strain increases. Most snatch blocks are made with one cheek to open, so that there is no need to reeve the fall rope through them, but care should be taken to see the latch properly closed. If the snatch block is made fast to the pole, a heel-rope to some point of fixing must be employed to counteract this pull, in an opposite direction; or some means taken of anchoring the foot of pole or shear legs as shown in Fig. 3. As the snatch-block will be loose until the strain comes on, it is necessary to put a mousing on the hook to prevent it coming out of the strop, and a cord to hold it up until the fall rope draws on it (as in Fig. 3) is a convenience, and prevents the rope riding on to the cheeks of block.

Crab.

The first thing to attend to with respect to this is to choose a spot for it which will give, by simply slewing it, a straight lead to the derrick wherever the latter may be wanted to be shifted. It should be placed so that when winding in the fall rope it leads over, and not under, the barrel, and when loaded the bulk of the weight should be on the back. Cement in bags is usually the most available form of kentledge on a building site, but unless they are kept covered a shower of rain will be an expensive matter. The nuts holding the stays should be looked to, to see that the carting has not loosened them, and plenty of thick grease or tallow on the gear wheels will considerably ease the running.

The fall rope should be rigged with three turns over the barrel, and two good scaffold cords tied to the frame of crab for "fleeting" the rope when the coils are wound to the end of the barrel. The pawl should be turned over to gear in with the ratchet. The power of crab is approximately for short lifts given as under: Multiply together the radius of handle in inches and number of teeth in barrel wheel and divide result by number of teeth in pinion, and again by half the diameter of barrel in inches. For double-purchase gear, multiply the above by the number of teeth in sliding wheel, and divide by the number in pinion. This result is multiplied by the pressure on the handles (viz., for short lifts about 25lb. per man), and 20 per cent. deducted for friction to get the nett power.

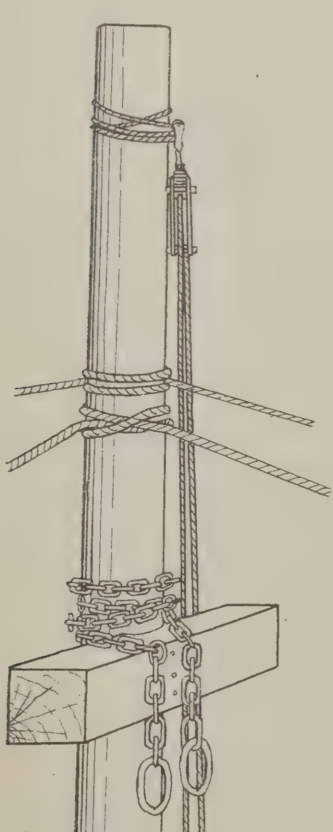


FIG. 1

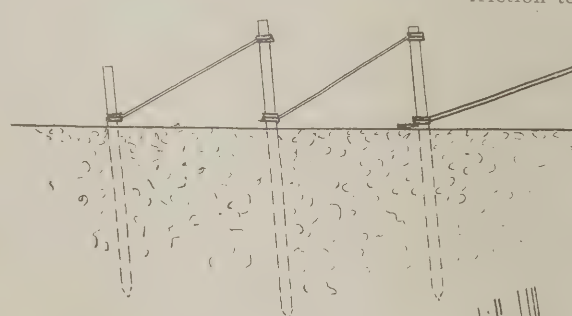


FIG. 2

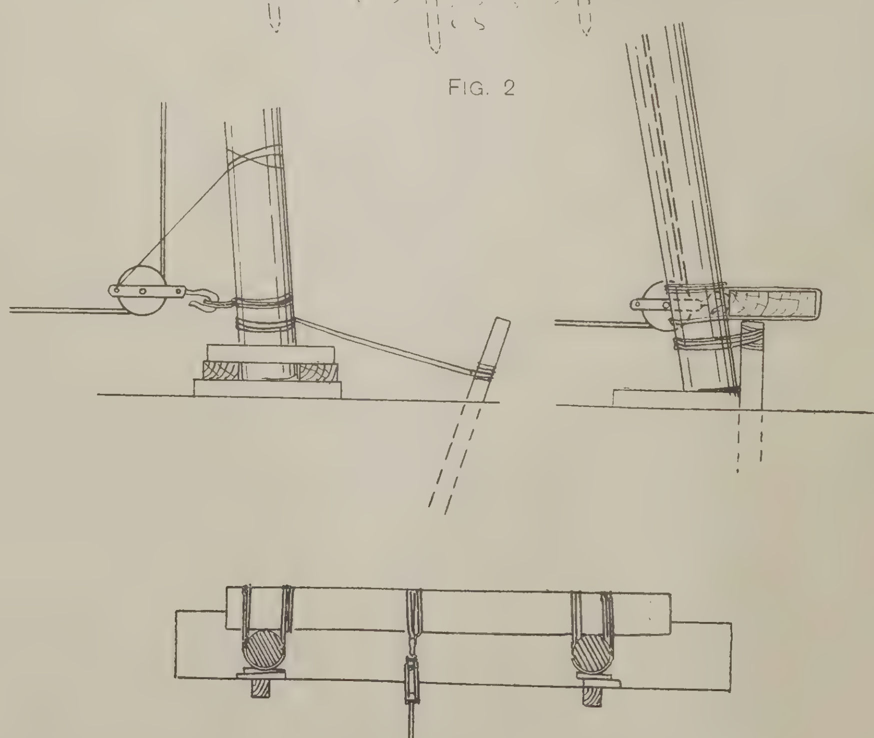


FIG. 3

FIG. 4

FIG. 5

Fig. 1.—Derrick Pole Rigged. Fig. 2. Shore Anchorage. Fig. 3.—Checks at Heel of Pole. Fig. 4.—"Blackwall" Hitch. Fig. 5.—Double "Blackwall" Hitch.

HOISTING AND FIXING STEELWORK.

Slings.

The slings, in the case of a girder, should be put on so that when lifted it is "on the balance," and an old sack used to give the chain a "bite" and prevent surging of the load. When very heavy work is being lifted, a better softening is made by pieces of soft wood carefully placed to let the links of chain ride clear of the edges, as a link caught on the sharp edge of a girder may be badly strained, if not snapped. With a chain sling a Blackwall hitch (Fig. 4) will hold well, but the bight of hitch must be drawn well up the neck of hook. For heavier weights the double Blackwall hitch is more secure (Fig. 5). Span slings are best avoided, as the strain on such a sling may easily amount to much more than the weight lifted, and they have been the cause of many accidents. Roof trusses are usually slung from the crown plate, but as they are not constructed to take reversed strains a light spar should be lashed across them about halfway up to prevent straining them.

When ready to hoist, a scaffold cord of sufficient length should be made fast close to each end of girder (but far enough from them to be clear of the bearings) to guide it into place. The men take on at the crab, the most reliable one being told off to "fleet" the fall when necessary, and one man behind the crab to haul in the rope as it comes off the barrel, keeping enough strain on it to make it bite on the barrel. When carrying out this work with a mixed lot of labourers, it is as well for the foreman to keep to the same expressions for the same operation, and use words which differ enough from each other to avoid mistakes due to the noise and business of other trades at work, such as "Heave up," "Steady," or "Lower out," Giving the word to heave up, the foreman should carefully

(a) Watch the snatch-block till the rope draws in it and runs free.
(b) Turn the lower block on its swivel, so that there is no twist in the tackle.
(c) See that fall is running free in both blocks and not riding and cutting on the cheeks.
(d) Check the swing of the girder sideways as it frees the ground.
(e) Watch that it is clear to the top of its lift from chafing against pole.
(f) See that weight is not all on one guy.

If the crab has not been recently used it is as well the first time to test the brake as soon as the girder is clear of the ground.

At this stage the foreman will see whether the weight has "drawn" the guys too much, whether the pole has rake enough, or too much, and whether the girder will run up clear of the pole at the top of its lift, and can make his dispositions accordingly. A little experience will soon enable him to judge how much the weight will alter the rake of the pole. He should also satisfy himself that all ties, strops, and guys are holding.

When the rope is wound to the end of the barrel, the man previously told off will call "Fleet, oh!" and will pick up the scaffold cords tied on the side frame of the crab where the winding commenced, and put a stopper knot and three turns with it on the fall rope, pulling the cords as tight as he can and holding it tight on the fall rope. When he gives the word, one of the others slips the pawl out of gear, and they slowly lower back the handles until the fleeting cords take the strain. When this is done the turns on the barrel are eased from the free end and shifted smartly back to the other end of the barrel, the pawl is slipped in, and the fall rope wound in again till the strain is off the fleeting rope, when it is taken off until again wanted. Care is to be taken that the cord used for fleeting should be strong enough to take the whole strain in the fall; also the stopper should be put on as far as possible from the crab, say, six feet; if it is put on close to the crab there will very likely be a jerk.

When the girder is up it is drawn into place by the guide cords previously tied on, and sometimes by easing off the guys only one at a time being loosed.

When the amount of bearing is known it is sometimes useful to mark it with a white chalk line on the underside of the girder, and from the foreman's instructions from below a man on top with a pinching bar can "pinch" it into position before the whole weight is off the tackle, taking care that the felt or lead seating is not displaced.

Where the girder is landed on a stancheon with bolt holes previously drilled, a man with a drift or "podger-ended" spanner, by putting it through the hole in the girder and watching his chance (while the girder drifts about an inch above the stancheon cap to push it through the corresponding hole in the cap), can draw it over while the girder is lowered, so that the holes are exactly opposite and the bolts can be put in immediately.

When fixing roof trusses of small span it is not always easy to ensure that the rag bolts which are usually specified shall come in exactly with the holes in the shoes of trusses.

A good plan is to cut the bolts in deep enough to drop right in the hole, enlarging the hole towards the bottom in the usual way. A string is tied to each before dropping them in, and the ends left out. When the truss is hanging over its place, and the shoes are over the templates, the strings are passed through the holes, and the truss lowered, and while part of the weight is still on the tackle, the truss is shifted till all the bolts can be drawn up by the strings and nutted.

The holes are then filled with a thin grout by a channel previously cut in the stone, or from the holes in the shoe which are mostly oval.

Sometimes in a confined space or when hampered by internal scaffolding which cannot be removed, it is easier to hoist trusses in halves, getting the first half in position and lashing it to a pole carried down to the girders of the floor below the top, or otherwise suitably braced. The second half is then lifted, being slung so that the shoe end is slightly the heavier. When up, this is manhandled on to the stone template, and the tackle slowly lowered out until a man on the crown of the first half truss can guide it between the crown plates and push a drift in as the holes come opposite. The tie bar joint is then bolted up before the weight is off the tackle.

There is one point which the writer would like to refer to with regard to fitted, i.e., cleated or fishplated, joints: that is, the frequent clause in specifications that "no drifting of holes will be permitted." In work which is made as it should be—a tight fit—owing to various causes, such as cleats being drawn in rivetting, angle plates drawn by punching, etc., it is impossible to bring holes opposite sometimes without the use of a drift, and most architects who understand this are willing to permit the use of a drift if rightly used.

The improper use of a drift in burring away the metal in holes not originally drilled opposite, is to be condemned, but it is a necessary tool in assembling work that is a good fit.

It will pay to plan out a fixing job from the start to the finish: to use the double purchase in the crab when single would do, or to use the crab for light pieces which would go up on the blocks in a fifth of the time, or to shift tackle over much are waste of time. On the other hand, a few minutes spent in getting at some idea of the strains to be provided for and the fitness of the gear for the purpose, will work for economy of time and labour.

Views and Reviews.

Mill Buildings.

The construction of steel mill buildings forms an important branch of constructional work, though, of course, it does not come within the general practice of an architect. Most of such work in this country is in the hands of civil engineers, though in the United States the design of such buildings is to some extent undertaken by architects. The first edition of the book was published in 1903, and we here review the second edition. The book is the result of two years' experience as a designing engineer and contracting agent for a manufacturing company in the United States, and four years' experience in teaching the subject at the University of Illinois. The book is intended to provide a short course in the calculation of stresses in framed structures, and to give a brief discussion of mill building construction. While the book is concerned chiefly with mill buildings, much of the matter will apply equally well to all classes of steel-frame construction, so that those particularly concerned with structural engineering will find the work very valuable. The book is clearly written; the theoretical explanations are admirably simple, and yet the difficult points in practice are by no means dodged as is too often the case in text-books produced by English authors. Diagrams are included of a number of buildings that have been erected in the United States, and increase the practical value of the book. Not the least useful feature is a general specification for steel-frame mill buildings, included in an appendix.

"The Design of Steel Mill Buildings and the Calculation of Stresses in Frame Structures." By Milo S. Catchum, Dean of the College of Engineering and Professor of Civil Engineering, University of Colorado. London: Archibald Constable and Co., 10, Orange Street, Leicester Square. Price: 16s. nett.

Reinforced Concrete Bridges.

Messrs. Tedesco and Forestier have in this work provided a most useful contribution to the practice of reinforced concrete construction. The work consists of an analytical study of eight detailed designs for road bridges, constructed in reinforced concrete, calculated in conformity with the French ministerial circular of October 20th, 1906. The designs are bound separately in the form of a pamphlet, and are reproduced to large size. The eight bridges are respectively of the following lengths:— 4, 6, 8, 10, 15, 20, 25 metres. The detailed analysis and explanation of the basis for calculations and construction is contained in a separate

volume, bound in paper covers. The work will be found most serviceable to engineers who have to deal with such problems. It is valuable to have designs worked out thus in detail, which even if it is not possible to adopt generally in the exact form chosen by the authors, will serve as a check upon other designs, and a useful commentary and guide.

"Recueil de Types de Ponts Pour Routes en Ciment Armé." By N. de Tédesco, Ingénieur des Arts et Manufactures, with the collaboration of Victor Forestier, Ingénieur des Arts et Métiers. Paris: Librairie Polytechnique Ch. Béranger, 15, Rue des Saints-Peres.

HAMMERSMITH BATHS.

(Concluded from p. 374, No. 671.)

Supplementing the articles we have already published of this building in our issues for November 6th, December 4th and 18th, we conclude our description and illustrations by publishing the working drawings of the cold water storage tank. This construction is carried out in reinforced concrete, and has a capacity of 25,000 gallons. It is situated above a yard over the coal bunkers, an entrance to which is provided from Scotts Road, and its location is shown on the first floor plan published on page 265 of our issue for November 4th. The storage tank is situated 28ft. above the ground line, and is supported on six concrete columns of a uniform size of 14ins. by 12ins. throughout, each being reinforced with four ¾in. Kahn trussed bars. These columns are carried down to the basement floor level, and are supported directly on a heavy concrete foundation raft 11ft. 9ins. below the ground, the lower length of the columns supporting a platform designed to carry coal vehicles. The space below the platform is used for coal storage, the coal being tipped directly on to the platform and dropped through holes provided for the purpose. The columns in this coal space have the corners protected by steel angle bars. The construction of the tank, and of this platform, is clearly shown in the drawings here published.

The following is a list of some of the sub-contractors who have supplied material or executed work in the building:—

Constructional Reinforced Concrete, including roof of first-class swimming bath, both ponds and water storage tank: The New Expanded Metal Co., Ltd.

Cement: The Associated Portland Cement Manufacturers, Ltd.

Constructional ironwork, including roofs: G. Aston and Son.

Electric fittings: F. and C. Osler, Ltd., and Art Fittings, Ltd.

Boilers: Bowes, Scott and Western.

Glazed bricks, linings to swimming ponds, and porcelain baths (both slipper and lassar): The Farnley Iron Co.

Slipper and lassar bath valves and wastes, and faience ware to first-class swimming bath: Doulton and Co., Ltd.

Facing bricks to front: Lawrence's T.L.B. bricks.

Tiling to walls of entrance corridors: Craven, Dunhill and Co.

Tiling to bath gangways: Pilkington's Tile and Pottery Co., Ltd.

Fibrous plaster: F. De Jong and Co.

Fire grates and mantels: Bratt, Colbran and Co.

Iron casements to front: W. T. Allen and Co.

W.c.'s and lavatories: J. Tylor and Sons, Ltd.

Wrought-iron railings to first-class gallery and grilles: Lockerbie and Wilkinson (Tipton), Ltd.

Lightning conductor: J. Lewis.

Iron manhole covers and gulleys: John Jones and Co.

Diving stages: Bradford and Co.

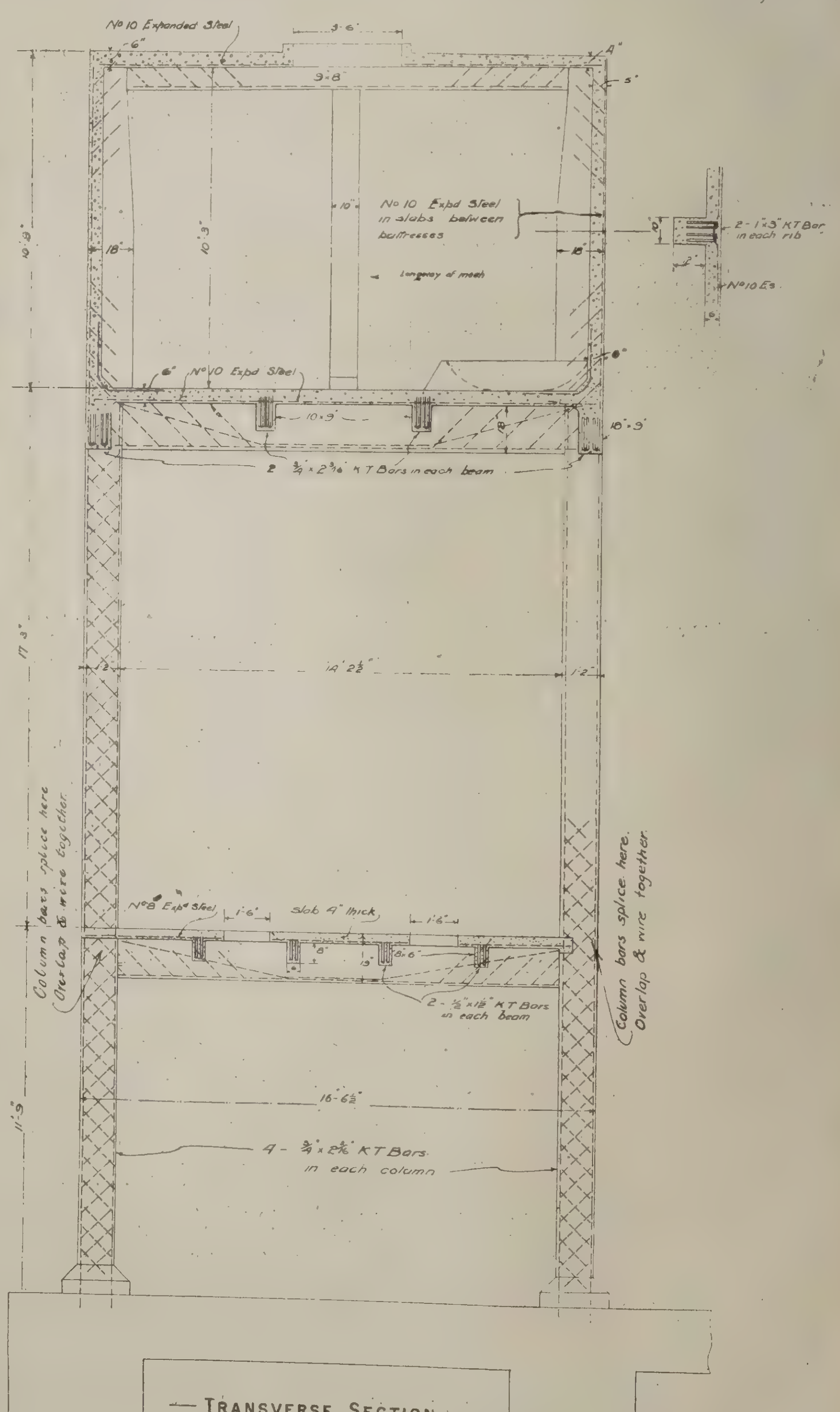
THE ARTISTIC EXPRESSION OF STEEL AND CONCRETE.*

By C. Howard Walker.

The artistic use of steel and reinforced concrete is considered a new problem in architectural design.

Wherever a combination of materials which is somewhat new in character becomes usual by the number of its examples, there appears a desire to analyse its component parts, to make its architectural expression characteristic, to enrol it under *architecture raisonné*, and naturally to exaggerate its peculiarities in the process. The intention is excellent, and admits of no contrary argument. What can be more undeniable than that architecture should express structure, and that unusual structure should demand unusual architecture? If any contention is at all possible, it can be merely in relation to the degree in which this construction is unusual, and, as a corollary, as to how unusual the architecture must be to express it. Is reinforced concrete new in the elemental factors of structure, and to what extent? Its main factors are vertical supports and horizontal loads (in which it resembles Greek structure), both of which are reduced in cross sections to areas less than in any other construction. It has no structural arch, though it has curved trusses or beams (in which it does not resemble Roman structure). It has

*A Paper read at the 41st Annual Convention of the American Institute of Architects held on November 19th, 20th and 21st, 1907.



STORAGE TANK AT HAMMERSMITH PUBLIC BATHS AND WASHHOUSES.

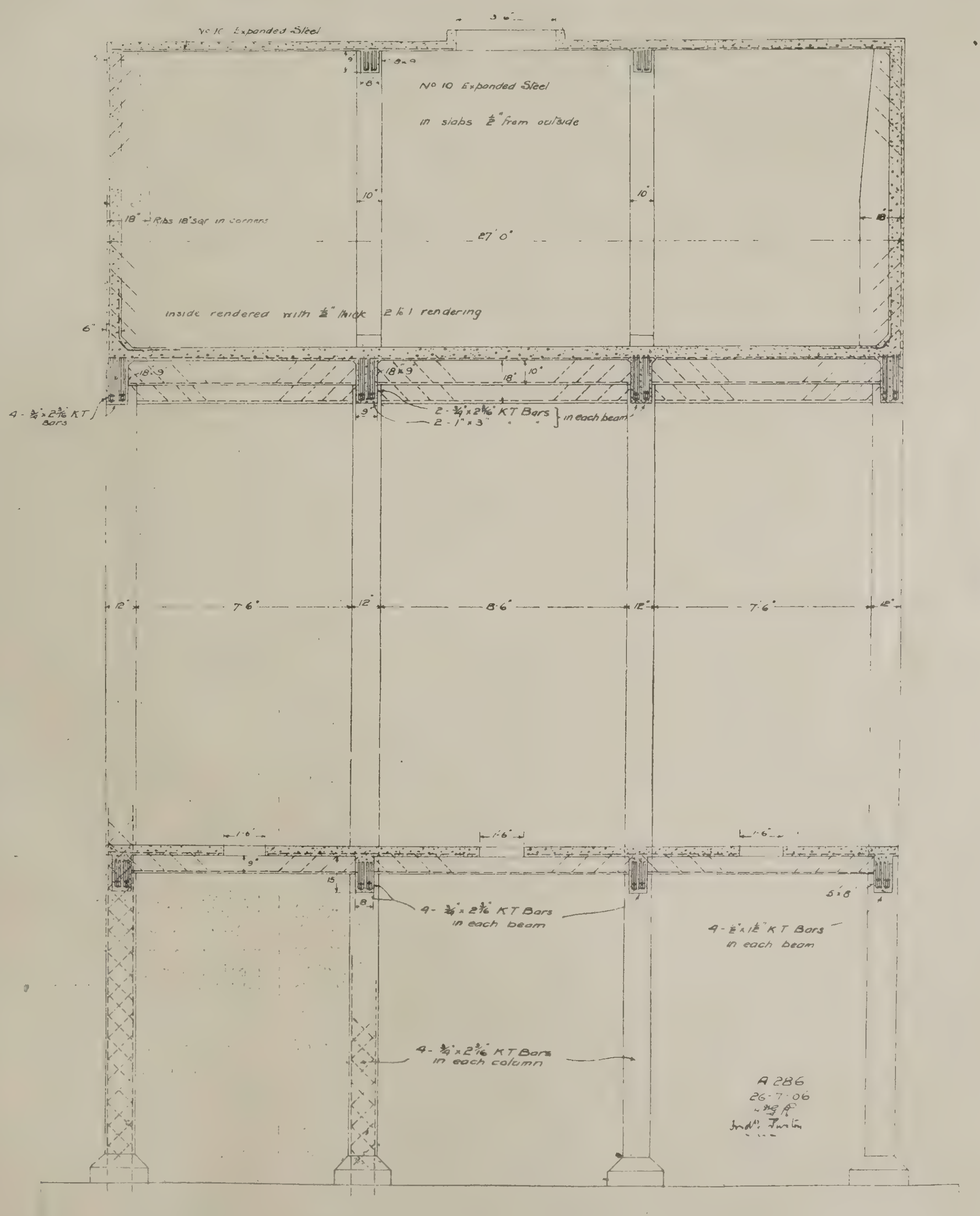
continuous vertical factors with the horizontal factors inserted between (in which it resembles much of Gothic architecture), and it has horizontal planes in its floors which appear on the facade, in which it is in no way unusual. What are the differences, apart from the areas of its cross sections, between it and other structures?

Main Features of Structure.

First, it is made up as far as its vertical factors are conceived of slender piers; second, as far as its horizontal factors are concerned, by beams of great possible span; and both piers and beams are each homogeneous, not built up of separate blocks as in stone or brickwork, and therefore corbels are inconsistent. A reinforced concrete structure is therefore a pier and beam structure of slender supports and long spans, its intercolumniation being much greater than in any previous type of building, and from our constant association with shorter spans the beams seem weak.

Treatment of Main Structural Factors.

The openings between the piers are unusually large, the whole structure appearing to be slight and undeveloped. Up to this point the choice of treatment seems to be merely as to whether the continuous vertical supports shall be announced or the successive planes of the floors. The decision as to which of the two methods of expression shall be adopted depends entirely upon the location of the building and upon the proportion of its height and width. Isolated buildings of great height may well be treated with long, vertical lines; but, in the majority of cases, the building requires a horizontal treatment, as it is associated with other buildings in the same block, and its assertion of verti-



LONGITUDINAL SECTION.

STORAGE TANK AT HAMMERSMITH PUBLIC BATHS AND WASHHOUSES.

cal lines is overwhelmed by the length of the base line of the block. Also the vertical lines are ineffective in shadow, as they can have but slight projection, and as they are merely surface indications of interior structure, and are not buttresses. Horizontal lines, on the contrary, always produce shadows. In most cases, therefore, the treatment of reinforced concrete buildings by horizontal lines announcing their floors (the distances of which apart are of much more nearly fixed dimensions than are the inter-columniation of piers or the height of verticals) is better in relative proportion to adjacent buildings, and affords stronger evidence of purpose than does the exaggeration of the verticals.

Treatment of Lintels.

The apparent weakness of the long lintel has been mentioned. This can be modified in several ways, either by crowning the centre, which is of little value in long spans, and is inconsistent with the concealed structure, or by arching the lower line of the lintel, or by bracketing at the piers. The cornice is capable of any treatment which does not suggest stone corbels or modillions. The next problem is that of the necessary filling treatment of spaces between factors of main structure of the openings between the piers and the successive floors. This is manifestly a screen only, whether of plain surface or of fenestration. It supports nothing. Its structural requirements are merely those of frames to openings and of surfaces between these openings. As its structure is unimportant and can be done in many ways, there is no reason that it should be announced than that the palm of a man's hand should announce the bones beneath. The anatomical structure of the building is adequately recognised when the piers and lintels are acknowledged; in fact, it is not necessary even in *architecture raisonné* to even announce them, provided they are not contradicted.

The suggestions for this secondary treatment of curtain walls between main structural factors may either be derived from minor structure or may be surface ornament only. If from minor structure, it is probable that it will evolve into a system of slightly recessed vertical panels. As the vertical factors in the structure are usually more in number than the horizontal ones, and as these factors are slender, the stiles of such panelling would be narrow. Vertical panelling, whether of the type of perpendicular Gothic, or the panels with modelled or mosaic borders of Byzantine work, or the Renaissance panelling of Fra Gioconda, are all suggestive of possible treatment. The frames to the openings can be treated like any frames, either simply or elaborately, as they are simply borders confining spaces. If, on the other hand, the surfaces are not to announce the minor structure, they may either be plain or have surface ornament, in the form of all-over patterns, low relief, mosaic or sgraffito, care being required only that the scale of the pattern or relief shall not be so great that it cannot be apparently readily carried by a thin wall. Deep reveals and soffites are necessarily artificial and not expressive of the structure, and the contrasts of light and shade usually obtained by these may be either produced by modelling or by coro, or both.

The basis of the structure is metal, which is concealed and protected in all important structural parts of the building, but can readily be announced in the openings, by grilles or delicate metal fenestration. Excellent opportunity and great latitude in design are possible, therefore, in the sub-division of the openings, either in cast or wrought metal, such detail being an admirable contrast to the other type of ornament of the concrete. The concentration and elaboration of grilles at the top of openings has numerous prototypes in all styles of architecture. Because metal is capable of long, sinuous curves, it is by no means essential that minor detail should adopt such an initial scheme and become thereby too important and out of scale with the other proportions of the building. The main surface of a reinforced concrete building is of concrete, a material which is homogeneous, has no joints, and is actually a thin skin to the structure, but sufficiently thick to cover and disguise the joints of the structure. It is inferior to most stone in vivacity of surface texture, and to both brick and stone in the scale given by constructive joints. It has, however, been more frequently used as a surface than any other material, and when finished with stucco, as with the Egyptians and Greeks, it presented a surface which admitted of equally the most vigorous and the most delicate polychromy. Its surfaces were those of unblemished parchment, making an admirable background not only for colour, but for impasto ornament. When two surface coats of contrasting colours were laid, sgraffito or scratched detail was possible, the only objection to this type of work being the action of frost upon it. Concrete surfaces also permit the insertion of fragments of other material, marbles, metal or glass or tiles embedded in it in patterns. Entire veneer of these, however, which entirely conceal the concrete, seem insufficiently supported unless they have their own independent system of apparent structure.

Another element of metal structure is that of the occurrence of stable projections, which are greatly in excess of those which can be safely supported by any other materials.

When such occur, as in bays, etc., the supporting factors should be strongly announced and even exaggerated, for we have not yet adjusted our sense of security to masses supported upon thin forms.

The Placing of Ornamental Detail.

Ornament in architecture accents the component parts, either of the structure or of the composition of the facade.

That which accents the component parts of the structure either accents the joints or indicates the interstices of structure.

The accenting of joints is usually performed by mouldings, or by concentrated spots, such as rosettes and capitals.

The indication of filling of interstices such as tympana, spandrils, panels, etc., any of which could be removed without jeopardising the structure, is usually by ornamental patterns.

The ornament which accents lines of composition is usually on vertical axes, and is of specially designed spots, such as keystones, cartouches, exaggerated corbels, etc. This latter type is used sparingly or is absent in the best architecture of all styles, excepting when it is in the form of pinnacles, canopies and heraldic scutcheons, in which case it has an individual purpose in addition to that of mere accent of vertical axis.

The position of ornament in reinforced concrete is not different from that of any articulated structure, but there are larger interstices, that is, larger surfaces of non-supporting wall; therefore it is not inconsistent that these surfaces, if ornamented at all, should be more generally ornamented than in stone buildings.

The general effect of reinforced concrete structure is that of lightness, of delicacy. Its mouldings and ornaments should correspond in character. The chief problem is to prevent an effect that is trivial and that lacks stability. The only method by which slender structure and delicate detail can be made vigorous is by contrast of simple surfaces with massed detail. In this case the simple surfaces are over the structural factors and the curtain walls; and the massed detail is associated with the openings and possibly with the cornice. Wrought metal grilles and balconies, elaborate fenestration, polychromy and surface modelling (both focussed), all afford opportunities for the embellishment of a system of structure which is devoid of large piers, deep reveals and heavy shadows. All are in accord with such structure and it is unnecessary to search for more sensational factors of expression A reinforced building is very apt to express itself tolerably well if none of the architectural detail applied to it is in imitation of stone, brick or wood forms, if its metal ornament is wrought and its concrete ornament plastic or mosaic, or painting. It presents but one new problem, that of making a thin thing as attractive as one with mass. As a matter of fact, solidity of mass enters largely into our feeling of permanency and stability, and it is probable that no large skeleton structure can ever compete with one having liberal third dimensions. Its character is that of lightness, which has always been associated with impermanency, but that quality accepted, as it needs must be, much can be done to make it attractive without inventing combinations of forms which are uncalled for, and which in themselves have no intrinsic value.

One of the constant criticisms of Roman architecture by instructors in architectural design is that the orders were used by the Romans merely as an ornament applied to the face of the construction. Partly engaged columns and pilasters which are not needed to indicate piers are amongst the examples cited of this solecism in design. Steel and concrete structure can, however, be well expressed in this manner, the engaged column often following literally the support within it, and the entablatures indicating the deep girders.

The design and ornamentation of the interiors of steel and concrete structures, in which the steel is covered, is not unlike that of any structure of columns, slender piers and beams.

In the cases which at times occur where protection from fire does not demand that steel structure shall be covered, and in which exposed steel is largely in excess of accessory concrete, the problem of artistic treatment becomes of a different character. Such structures are armory and large hall arched trusses, bridge spans, etc., *i.e.*, either straight or curved trussed beams. These are especially interesting in elevated railway structures, and elsewhere where they are so frequently and continuously conspicuous, and where they are in this country so persistently made utilitarian only, with but little attention paid to the possibility of subtle line. This is all the more to be deplored from the fact that metal if scientifically related in its form to strain and stress takes naturally some of the most delicate and subtle curves possible, but the custom, because material is cheaper than labour, is to erect structures assembled of straight lines

only, with the occasional use of curved lower members. This is the principal reason for the apparent crudeness of steel structures. They are articulated structures, built up of component parts bolted together. The interstices are larger in area than the factors of structure, and the structure has therefore a latticed cobweb effect. Its satisfactory appearance depends entirely upon the design of the cobweb.

The lines of the main factors of the trusses can have the spring and curve which are so characteristic of metal under pressure while the minor factors of struts, rods, braces, etc., may be assembled, so that certain combinations repeat and others indicate design and their silhouettes may be studied. For a steel truss structure inside its main lines is effective by its silhouette alone. In many cases the mere multiplicity of parts is detrimental to scale; the perpetual crossing and recrossing of lines being more suggestive of wreck than of safety. So much is this the case in parallel bridge trusses that covering the structure or filling the interstices of the two outside trusses is at times advisable to give apparent stability to the span.

THE MANUFACTURE AND TESTING OF PORTLAND CEMENT.

By a F.C.S.

(*Concluded from p. 348, No. 669*).

The object of the tensile (or stretching) test is to determine the greatest stress per square inch which, under given conditions, the cement can be made to stand without rupture. If the conditions have been carefully observed, and yet several discrepant results are obtained, the highest may be right, but the others are certainly wrong. No averaging should be done, although the British standard specification permits the averaging of six briquettes to obtain the tensile results of the cement under test, the minimum strain then demanded being:—

	Neat.	1 + 3 Sand.
7 days	400 lbs. per sq. in.	150 lbs. per sq. in.
28 ,,	500 lbs. ,,	250 lbs. ,,

In respect of the uncertainties due to the personal characteristics of the tester, and to the influence of local conditions, this test offers greater scope for error than any of the others considered.

The most scrupulous care must be observed in the manipulation, and the tester should possess natural aptitude for such work.

Until the advent of the British standard specification, there was no standard method of testing cements in this country, and engineers frequently arranged their own specifications for testing, but the average requirement for a tensile test of neat cement was from 450 to 550 lbs. per square inch in seven days, and 700 to 850 lbs. in twenty-eight days, these being the two periods most generally adopted, and, on the whole, the most convenient. A tensile strength above the average mentioned need not, however, excite suspicion as to the soundness of the product, as is often the case, for a carefully made cement will often sustain very high strains before fracture; and if such a cement withstands the far stricter accelerated tests (which will be referred to in the following article) for deciding as to the safety of the material, a high strength may certainly be looked for as one of its decided qualities.

It is, however, sometimes the case that a high tensile strength may be caused by overliming the raw material, but since a number of tests are in vogue for indisputably discovering such a weakness in a cement, one can by these means readily confirm the records of tensile test and prove the soundness of the materials. With the now increasing demand for a finely-ground cement, it is to be expected, and, in fact, it should be urged that in place of neat tests an admixture of sand should be employed in estimating the value of the sample. In the neat tensile test, the full value of the cement as a concreting material, or as a cementing power never comes into play; and, granted that a finer cement is a more valuable product, a coarse sample will, in a neat test, give results as to tensile strength equal to those obtained by a finer cement. But, on the other hand, the difference between the constructive values of a coarse and a fine cement will be most noticeable in a test for tensile strength, carried out with a mixture of sand and cement in the proportion of 3 to 1.

The value of sand tests in the place of neat tensile tests is more appreciated day by day, and this hardly requires an explanation beyond what has already been written.

In neat tests the full cementing power never comes into play, but in a sand test the more practical concreting qualities of the product are ascertained as well as its value as a constructive material.

The Prussian standard rules for testing cements provide that the strength of a cement shall be always determined on a mixture of three parts by weight of quartz sand, and one part by weight of the cement, and better quality cement would be supplied and used if a similar rule were more generally adopted in this country. Where the sand tests are adopted in England the tensile strains required of a mixture in the above proportions is about 150 lbs. per square inch in seven days, but this standard is too low for a finely-ground product of good quality, and a strain of 250 lbs. per square inch should be demanded.

In the preparation of briquettes, it is advisable, as far as possible, to have all moulds, which should be made of gunmetal, shaped exactly alike, and the gauging of each briquette should be carried out in exactly the same manner. As the value of the tensile strength test depends mainly upon the preparation of the briquettes, it is necessary that precautions be taken so that the personal equation is, as far as possible, eliminated, by ensuring that the proper percentage of cement and water is always strictly observed. In preparing the briquettes, after the mixing of the sample cement, care should be taken that the moulds have been properly cleaned and placed on small plates of iron or slate. For the neat test, weigh about five ounces of cement to each briquette. Turn the weighed cement out in a heap on to the slate slab, and gradually pour on the exact amount of water which it has been previously determined will provide the consistency required. Then trowel the cement thoroughly and quickly into a paste, and fill the mould, so that the material is solid and free from air spaces, and finally trowel the top side of the briquette.

During setting the briquette should be placed in a damp place, or covered with a cloth saturated with water, and allowed to remain for 24 hours in a place free from any vibration. A briquette that has thus been allowed to harden slowly, and has been kept free from any hot, dry, or draughty atmosphere, may be relied upon as being stronger, and the testing results more uniform than is the case where the water is evaporated from the cement too quickly.

After the preparation of the briquettes, they should be taken from the moulds when set thoroughly hard—generally after 24 hours by hand gauging—and immersed in fresh water of 60 to 70 degs. Fahr., until tested, and the briquettes should always be broken within one hour of being taken from the tanks. The method of arranging the clips of the testing machine in which the briquette is held is an item needing every attention, and, in order that the stress shall be uniform, great care must be exercised in perfectly centering the briquette in the clips. It is necessary also that the strain applied be always regular. The normal standard speed of applying the strain is 400 lbs. per minute. The testing machine generally used in this country is the "Adie" testing apparatus, with automatic regulator.

The tensile strength test often gives variable results, and part of this variation is inevitable. The strength of Portland cement depends so largely upon the details of the method of testing, that variations in manipulating among a number of other and minor causes make an appreciable difference in the results, and the neat tensile test is therefore governed by many circumstances.

The following particulars include, perhaps, most of the common causes of divergent results in the tensile test:—

(1) *Due to the cement.* Whether the cement is fresh or has been aerated, and if the latter, the period of aeration.

(2) *Due to gauging.* The amount of water used in mixing the quality, character and temperature of the water used in gauging. The temperature of the room. Whether the cement is hand or machine mixed Whether a non-porous slab is used as a mixing tray.

(3) *Due to the preparation of briquettes* Whether a skilled operator has been employed. Whether the mould is of wood or iron. The shape of the mould, the method of filling and whether the mould was filled at one or several operations. Whether all air bubbles have been eliminated. Whether the mould is shaken, tapped, rammed or pressed to make the briquettes of various densities.

Whether the briquettes are kept damp during setting, and whether kept dry or in water during the period of test. Whether the briquettes are made by the same operator on the same day under the same conditions. The temperature of the water used for immersion.

(4) *Due to the testing.* The temperature of the testing room. The length of time the briquettes have been out of the water previous to testing. The area of the breaking section. The form of the briquettes, and the shape of the cross section at the point of fracture.

The nature of the strain, and whether suddenly or gradually applied, and the time occupied in applying the strain. The form of clips in the testing machine for holding the briquettes. The position of the strain as regards the breaking section of the briquettes, and the preventing of cross strains. The unequal bearings of the clips on the briquettes.

The fact that there are so many separate factors connected with the making and testing of briquettes, all of which

have a distinct and definite influence on the subsequent tensile strength need not, however, unduly point to the inconsistency of the test.

For instance, the age of the cement after grinding is found to affect the tensile strength of a briquette; but as the manufacturer is responsible for the state in which the cement leaves his works, we can rely upon him looking after his own interests in this direction.

The percentage of water to be used in the gauging of briquettes is generally from 18 to 22, a proportion which varies according to the age, fineness and activity of the sample.

For briquettes of three parts sand to one of cement, about 12 per cent. of water is required (the percentage being calculated on the total weight of the sand and cement).

The best results are obtained with a minimum quantity of water, and a dry or stiff plastic mixture gives greater uniformity.

The water to be used in gauging must be clean and fresh, and of a temperature of about 60 to 70 degs. Fahr. In the gauging of briquettes by some testers the cement and water is thoroughly mixed for three minutes, and then pressed into the moulds by the handle of the trowel used in gauging.

Any excess cement should be removed, and the top of the briquette smoothed off level with the mould, the mould being then turned over to enable the reverse side of the briquette to be smoothed. Particular care should be taken that the mixing is carried out upon some non-absorbent substance such as a slab of slate or thick glass.

In conclusion, it should be pointed out that the accurate testing of cements for tensile strength is *not* a simple process. Some experience is necessary so as to obtain even approximately accurate results.

The tests carried out by inexperienced, though intelligent and careful persons are usually very contradictory and inaccurate, and no amount of experience can totally eliminate the variations introduced by the personal equation of the operator.

Soundness Tests.

The most useful tests for cement are those which connect themselves definitely with some serious defect to which cements are subject, or with some merit which they should possess; and thus, perhaps, the test for soundness is of paramount importance. This test can be made with the most simple apparatus—if, indeed, any apparatus is required at all—is easy of manipulation, and its results are obtained immediately. Again, the tests which we shall explain under this heading are freest from personal equation and errors due to local surroundings.

The test for soundness, indeed, at once obviates many difficulties which arise in the long-time tensile tests for the acceptance or rejection of cements, and the issue of the test for soundness is finally decisive. It cannot, however, be stated with any degree of certainty that results which may be obtained by the "hot" test—the now general test for soundness—are identical with those which may be experienced in actual construction work, but there is no doubt that if a cement is in the slightest degree unsound, the hot test will at once detect and emphasise the weakness.

Numberless methods are in vogue for ascertaining the soundness of cements, and the enquiries more generally classified under this heading are those which have reference to constancy of volume; and to this end the accelerated or boiling tests are employed in order to ascertain the exemption of the cement from undue expansion or contraction.

Although, scientifically speaking, there is no constancy of volume in Portland cement—since the setting of cement, as well as heat and cold, will modify the volume—yet practical results are obtained from the observation of pats of cement remaining over from the setting tests, and kept for this purpose in air, or immersed in water.

In a thoroughly sound cement the difference in volume is not noticeable without the aid of scientific apparatus, and the practical value of the test for constancy of volume consists in ascertaining the more common defects in the undue contraction and expansion tendencies of Portland cement.

Most of the trouble of cement users is due to the expansion of the material through over-liming and other faults in the manufacture. This causes a swelling and ultimate disintegration after the work is in place. An old-time device for the testing of over-limed cements is to mix a sample of the material with water to about the consistency of treacle, the whole being then poured into an ordinary bottle or small glass test-tube, which is shaken until full to overflowing, and then placed aside in a cool place. If the cement is over-limed, or even if the proper grinding and amalgamation of the raw materials have not been properly carried out by the manufacturer, the cement will expand in setting, and split the glass sooner or later, according to the degree of the imperfection. If, on the other hand, the cement is *under-limed* (or over-clayed), it will contract in setting, and become loose in the receptacle.

In the "bottle" test care should be taken to keep the same in a cool place of even temperature; for, if placed in a warm atmosphere or near a fire, a cracked bottle will result through expansion even if the cement be perfectly sound

The simplest test, however, for the observation of the behaviour of cements is to make up two small pats—each about three inches in diameter and one-quarter inch thick in the centre, diminishing to very thin edges. The parts should be gauged and placed upon pieces of glass, and as soon as set—or, say, 24 hours after gauging—one of the pats is immersed in water, and the other left in the atmosphere.

Both pats should be carefully examined at regular intervals for a period of 3 to 8 days, and the first indication of any disturbance or disintegration will be detected by the appearance of small cracks round the edges, or extending from the centre of the pats. Other alterations of form will follow, such as the lifting up at the edges, or in centre of the test pat. For the acceleration test the pats should be immersed in cold water which is then brought slowly up to boiling point and the pats of cement are boiled for three hours.

A good Portland cement will show no signs of cracking, scaling, crumbling, or warping; nor, indeed, will it suffer any deviation or form whatever.

Any defect in the sample will first appear in the pat under water or in the hot test, but since, in the cold test, it often happens that the evidences of unsoundness are so long in appearing as to render the test of little practical value, this method has given way to the accelerated or hot-water tests mentioned above.

The great value of the hot test lies in the short time which elapses before the indications of defects begin to appear, and thus attention is at once directed to weak points in the cement to be further observed or guarded against.

Cements which stand the accelerated tests should be used in preference to others, and such tests should be constantly applied on the work of concrete construction; for although the hot tests sometimes reject suitable material, it will always reject a material unsound by reason of the existence of active expansion.

Contraction cracks in the test pat are not necessarily a sign of bad quality, but are perhaps more generally found to be due to faulty testing rather than to a deterrent quality in the nature of the cement. A cement which is over-clayed will contract, but contraction cracks are found also if the test pats, when moist, are left in the sun or in a dry atmosphere, or even if the drying takes place too rapidly in draughts of air.

These contraction cracks, as distinguished from those caused by expansion, are irregular lines in the centre of the sample pat, and are often caused by placing the mixed cement on a dry, porous plate; an excess of water, too, in the gauging will cause a shrinkage or contraction.

An expansion crack, however, will be found to commence upon the outer edges of the pat, and run towards the centre. This is by far the more serious defect.

The expansion of cements is generally caused by what is known as "free" or uncombined lime, and this is introduced into the product either by the careless or unscientific mixing of the raw materials used in the manufacture, or by the incorporation of underburnt clinker from the kilns.

If a cement is poorly manufactured, the aeration or atmospheric slaking will eliminate, to some extent, what free lime may be present, but a properly manufactured cement will withstand the hot or boiling tests as soon as the material is taken from the grinding mills, and any period of aeration, other than the time elapsing between the grinding into the manufacturers' stores and the loading of the cement into trucks is unnecessary.

The Le Chatelier test for soundness is the latest method of obtaining quantitive results by the soundness test, and is carried out by a very simple apparatus on the market, consisting of a small split cylinder or mould, 30 millimetres internal diameter, and 30 millimetres high.

The mould is filled with cement with a glass cover top and bottom, and then placed in water to set, and after 24 hours the distance between the indicator point, attached to the mould on each side of the "split" is measured. Immerse the cylinder and cement into cold water and then boil for six hours, and when cool again, measure the distance between the indicator points and the result must not exceed 10 millimetres after 24 hours' aeration of the cement.

A cement coming within this test can then be passed as of good quality. The Le Chatelier test is the soundness test imposed by the British Standard Specification, and is now generally accepted as the best accelerated test for proving the soundness or otherwise of Portland cement.

Correspondence.

Decoration of Armoured Concrete Buildings.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Your issue for December 4th last contained the first part of a very able lecture by Professor Henry Adams, in which he points out that at present we cannot claim very many artistic works in this new material.

I quite agree with him, but it is only fair when taking into consideration this question, that we should remember that the principal qualities which are generally required from armoured concrete by architects are strength and fire-resistance. In this respect there is an advantage over steelwork, inasmuch as the latter only possesses strength. It should be known, however, that it is possible to decorate buildings in armoured concrete, and in order to prove this I am sending you a photograph showing the interior of one of the largest shops in Paris, "Aux Classes Laborieuses, Ltd.," entirely constructed on the Coignet system. This illustration speaks for itself and needs no comment. It demonstrates that although armoured concrete has been practically limited to the construction of warehouses and engineering works, it can be easily decorated either in moulded concrete or in plaster.

Yours faithfully,

G. C. WORKMAN.

The Bane of Municipalism.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—In your leader for December 11th, referring to the collapse of a floor at Manchester, you say: "We think there should be municipal officials in all districts charged with the duty of examining buildings and insisting upon their safety being assured," etc. Why? Why turn to a municipal official for salvation at every turn? Have not we enough municipal officials already? Surely it is one of the curses of present-day life that every new Act of Parliament, every new educational and sanitation fad adopted, results principally in more officials being created. It is the same refuge of the careless —the mistaken Socialism of the day —all round; let us have officials to do everything for us, until the poor private practitioner is entirely eliminated! The evil of it is obvious. Relieve the private individual of responsibility and his character deteriorates. Relieve the parent of his responsibility to feed his children and he wilfully neglects to do so. Relieve the architect and building owner of responsibility for their buildings and you lower the standard of character required in the design of a building.

I am one of those who think that national character is sapped (and, incidentally, the architect robbed of many a fee) by officialdom; that half the building bylaws are unnecessary, with three-fourths of the officials who are appointed to see them carried out; that those who build would build better, and would employ professional assistance more, if they were placed under heavy penalties for the untoward effects of unsafe walls, unstable floors, unsavoury drains, high buildings without fire escapes, and all the other evils of bad design and construction, and then left to build as they like. There is no need for official inspection of everything. We don't send a policeman into every house to see that the ordinary householder is not running an illicit still or making half-crowns out of lead. We make the penalty for these crimes pretty severe, and wait till one is found out before we put the law in motion. Heaven save us from more officials!—Yours truly,

C. H. S.

Tunbridge Wells.

[Our correspondent admits that the present state of affairs is unsatisfactory. His quarrel is with the means of effecting reforms that legislation has favoured for many years past. We did not suggest that the architect or the building owner should be relieved of responsibility, but merely that the apathy and ignorance of the public in putting structures to uses for which they were never designed should be prevented from endangering the safety of persons involved. We suggested only that the safety of factories, warehouses and places of public assembly should be regularly examined, and that every building of these classes should be licensed for use for a certain purpose, and that before it could be used for another purpose a fresh license should need to be obtained permitting the change. We cannot see that any great multiplication of officials would be rendered necessary by such regulation, and, instead of architects being robbed of work, they would be called in more often to effect alterations required to meet the wishes of the authorities.—Ed. B.J.]

A New Window.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—If Mr. Crompton, who claims to have invented the window illustrated in your issue for December 18th, will visit Glasgow, he will find the same to have existed in Elmvale and other schools there for years back, Mr. Clifford being the architect.

Yours truly,

D. FORBES SMITH, A.R.I.B.A.

Kirkcaldy.

A NEW CATALOGUE has just been issued by the Patent Indented Steel Bar Co., Ltd., of Queen Anne's Chambers, Westminster. The former catalogue of this firm was notable as an able compilation, and this latest catalogue is still more valuable. It deals with the application of "indented" steel bars to the practice and theory of reinforced concrete, and should be in the hands of all persons interested in the subject, for it serves partly as a text-book, and will be found of service to the student and practising engineer alike. The treatment of the theory of the subject is extremely clear, short, and to the point, while the many photographs and diagrams explanatory of the construction of works in England and the United States in which "Indented bar" reinforcements have been used are not only interesting, but valuable records for reference.

SHOP IN PARIS SHOWING DECORATIVE TREATMENT IN REINFORCED CONCRETE.

Notes and News.

THE NEW MUNICIPAL BUILDINGS AT LAMBETH are to be opened by the Prince and Princess of Wales at the end of February. The buildings are situated at the corner of Acre Lane, in the Brixton Road. Messrs. Warwick and Hall are the architects, and Messrs. John Greenwood and Co., Ltd., are the contractors. The cost of the new buildings is estimated at £40,000.

* * *

ST. AUGUSTINE'S PAROCHIAL HALL, CROYDON, was formally opened recently by the vicar, the Rev. J. H. White, M.A. It has been erected at a cost of about £2,700 from designs by Mr. Frank Windsor, architect, of Croydon; the contractor being Mr. Potter, of Croydon. The main hall is 55ft. long and 36ft. wide, and accommodates 450 persons, with stage, retiring rooms, kitchen, etc.

* * *

DISCOVERY OF A RESERVOIR UNDER EXETER CATHEDRAL.—An interesting discovery has been made in Exeter Cathedral. Workmen engaged in some alterations in the canons' vestry suddenly came upon a deep hole sealed with a slab of stone. On examination, it proved to be a rectangular chamber 20ft. by 15ft., and about 20ft. deep, with vaulted roof. Water stands in it at a depth of about 2ft. The place was probably a well or reservoir for water.

* * *

CHANGES OF ADDRESS.—Messrs. Charles Heathcote and Sons, architects and building engineers, have moved their London office from 10, Savoy Court, Strand, to 110, Cannon Street, E.C. New telephone No. 2797, London Wall; telegraphic address—"Interjoin," London. Their Manchester office remains at 64, Cross Street. Messrs. Ripolin, Ltd., have moved their offices from 110, Fenchurch Street to 35, Minories, E.C. The telephone number (435, Avenue) remains the same.

* * *

THE NEW G.P.O BUILDINGS in course of erection (on the Hennebique ferro-concrete system) on the site of Christ's Hospital, Newgate Street, were visited recently by the students of the building construction classes at the polytechnics at Croydon, South Norwood, and Thornton Heath. Messrs. Holloway Brothers are the contractors for the work. Such visits afford students the opportunity of acquiring an intimate practical knowledge of modern building construction, and arrangements at the polytechnics named will be made for inspecting other works in progress during the session which commences on January 6th.

* * *

A NEW ORGAN in Childwall Parish Church was dedicated recently by the Lord Bishop of Liverpool, Dr. Chavasse. It is the gift of Mr. Walter L. Gladstone, of Court Hey, and has been erected in memory of his parents (Mr. Robert Gladstone and his wife) and of his uncle, the late Mr. W. E. Gladstone. The instrument ranks as one of the finest in the Liverpool district, after, of course, the one in St. George's Hall; it has been built by the same makers, Messrs. Henry Willis and Sons, of London and Liverpool, and is enclosed in a fine oak case, designed, together with the new gallery in which it is erected, by Mr. J. Francis Doyle, of Liverpool.

* * *

NEW WINDOWS IN BRISTOL CATHEDRAL.—The old windows of the chapter-house at Bristol Cathedral have just been taken out, and their place filled by new windows made from some of the ancient glass of the cathedral, dating from the 13th, 14th and 15th centuries. The earlier history of these beautiful fragments is somewhat obscure, but probably they were collected from many of the windows, some of them being clearly taken from the great Jesse window at the east end of the church. The new windows, which really amount to a sort of splendid patchwork, are set in a frame of plain faintly-tinted Cathedral glass, which is leaded in a kind of zig-zig pattern, more or less in harmony with the Norman stonework in which it is set. The work, as in the case of the earlier reconstruction in the north aisle, has been carried out by Messrs. Joseph Bell and Son, of Bristol.

Obituary.

MR JAMES MARSHALL, architect and surveyor, of Morecambe, committed suicide recently at Westgate, by cutting his throat with a razor. He was 52 years of age, and had been in bad health for some time.

* * *

MR. FRANK J. BREWER, F.R.I.B.A., of Richmond, Surrey, died on Christmas morning, aged 57. He was the architect for the various additions that have been made to the Royal Hospital and the Free Library at Richmond. Many buildings in the town were also erected from his designs; in particular the London and Provincial Bank, the Arcade, and Messrs. Wright's establishment in George Street.

Tenders.

Acton.—For the erection of additions to the Central Council School, for the Education Committee of the Acton Urban District Council. Messrs. E. C. P. and H. Monson, architects to the Committee, 182, High Street, Acton, and 22, Buckingham Street, Adelphi, W.C. Quantities by Mr. F. T. W. Miller, 8, Dartmouth Street, Westminster:—

Barret, Smith and Co., Finsbury Circus Buildings, E.C.	£2,803	0	0
Spencer, Santo and Co., Kensington	2,652	10	0
F. Bissley, Maidenhead ...	2,520	0	0
Mason and Coper, Sherwood, Notts.	2,460	0	0
G. H. Gibson, High Wycombe	2,327	0	0
Smith and Co., Manchester Square, W.	2,266	0	0
Wilcock and Co., Wolverhampton	2,250	0	0
E. Fitt. McCarthy, Reading	2,237	0	0
Galbraith Bros., Camberwell Green Works	2,220	0	0
H. C. Clifton, Bayswater ...	2,200	0	0
Dorey and Co., Brentford ...	2,190	0	0
Geo. Bollom, Essex Road, Acton	2,188	0	0
Vigor and Co., Westminster	2,182	0	0
B. E. Nightingale, Albert Embankment	2,180	0	0
Abbott and Charlton, Acton	2,171	10	0
W. J. Roberts, Finchley ...	2,163	0	0
F. G. Minter, Putney	2,149	0	0
W. J. Dickens, Ealing... ...	2,069	0	0
F. and E. Davey, Southend-on-Sea	2,053	0	0
L. F. Lamplough, Notting Hill	2,051	0	0
Barker and Co., Kensington	2,047	0	0
Hyde and Co.,* Norwood Junction	1,966	0	0

*Accepted.

Architect's estimate, £2,350.

Bodmin.—For the construction of sewage disposal works, for the Urban District Council. Messrs. S. W. Jenkin and Son, engineers, Liskeard, Cornwall:—

Pethick Bros., Plymouth ...	£6,147	0	0
Buscombe and Sons, Bodmin ...	6,000	0	0
S. Roberts, Ltd., Plymouth ...	£5,770	12	1
W. G. Fisher, Millbrook ...	5,766	0	2
R. Grose, Bodmin	5,277	8	6
R. H. B. Neal, Ltd., Plymouth	5,170	12	1
Edwards and Co., London ...	4,924	8	1
W. E. Bennett, Bodmin ...	4,719	2	0
Steer and Pearce,* Plymouth...	4,347	11	0

*Accepted.

Coventry.—For sewering, metalling, and paving the new road, etc., on the Binley Road Estate, for the Rugby Benefit Building Society. Messrs. Franklin and Newman, architects, etc., 43, Regent Street, Rugby:—

Parnell and Son, Rugby ...	£1,602	11	0
Boon, Coventry	1,560	0	0
Moss and Sons, Loughborough	1,557	9	1
White, Handsworth, Birmingham	1,538	16	2
Harper, Carlton	1,430	5	11
Jewell,* Market Harborough	1,338	12	6

*Accepted.

East Hartford (Northumberland).—Accepted for the erection of a new Council school to accommodate 240 scholars, for the Education Committee of Northumberland:—

E. Henderson and Son, Ponteland, Newcastle-on-Tyne, £2,490 6s.

Fourteen tenders were received.

Tickhill (Yorks.).—Accepted for the erection of a new public library, for the Urban District Council.

Rawson and Sons, Tickhill, £1,267.

Hunstanton (Norfolk).—For alterations and additions at Hunstanton Schools. Mr. Herbert J. Green, architect and diocesan surveyor, 31, Castle Meadow, Norwich:—

Gutteridge and Son, Peterborough	£2,273	0	0
Spencer, Santo and Co., Ipswich	2,254	0	5
F. Southgate, Hunstanton ...	2,133	17	3
Dye and Allen, King's Lynn	2,131	0	0
Clarke and Son, Cambridge...	1,977	0	0
G. W. Heath, March	1,972	0	0
Reuben Shanks,* Chatteris ...	1,795	0	0

*Accepted conditionally.

Ketteringham (Norfolk).—For few roofs to nave and chancel, and other works, at Ketteringham Church. Mr. Herbert J. Green, architect and diocesan surveyor, 31, Castle Meadow, Norwich:—

J. Youngs and Son, Norwich ...	£1,569
Reuben Shanks, Chatteris	1,440
J. S. Smith,* Norwich	1,212

*Accepted conditionally.

Ilford.—For the erection of Baptist schools and institute in High Street. Messrs. George Baines and Son, architects, 5, Clement's Inn, Strand, London, W.C.:—

George Parker	£2,885	14	4
H. J. Carter	2,873	0	0
F. J. Coxhead	2,763	0	0
J. Smith and Son	2,672	17	6
H. Knight and Son	2,664	0	0
Mattock and Parsons	2,654	0	0
A. E. Symes	2,644	0	0
W. Lawrence and Son ...	2,612	0	0
C. Castle and Son	2,578	0	6
Battley, Sons and Holness ...	2,545	0	0
W. J. Maddison	2,535	0	0
Hammond and Miles	2,524	1	1
S. Hammond and Son ...	2,459	0	0
F. and A. Willmott* ...	2,426	5	0

*Accepted with certain alternative estimates.

New Companies.

A. TURNER and Sons, Ltd., joiners, builders and contractors, 347, Stockport Road, Manchester. Capital: £2,000.

HUNWICK BRICK AND TILE WORKS, to acquire the business carried on by G. Trotter, at Hunwick, Durham. Capital: £3,500.

Bankruptcies.

During the week ended December 27th seventeen failures in the building and timber trades of England and Wales were gazetted.

J. SMITH, builder, Westcliff-on-Sea. P.E., Shirehall, Chelmsford, Jan. 1, at 10.

J. WILSON, builder, Acton. First meeting, 14, Bedford Row, W.C. Jan. 2, at 3. P.E., Brentford C.C., Jan. 7, at 11.

J. H. GIBBS, builder and contractor, Putney. P.E., Wandsworth C.C., Jan. 9, at 12.

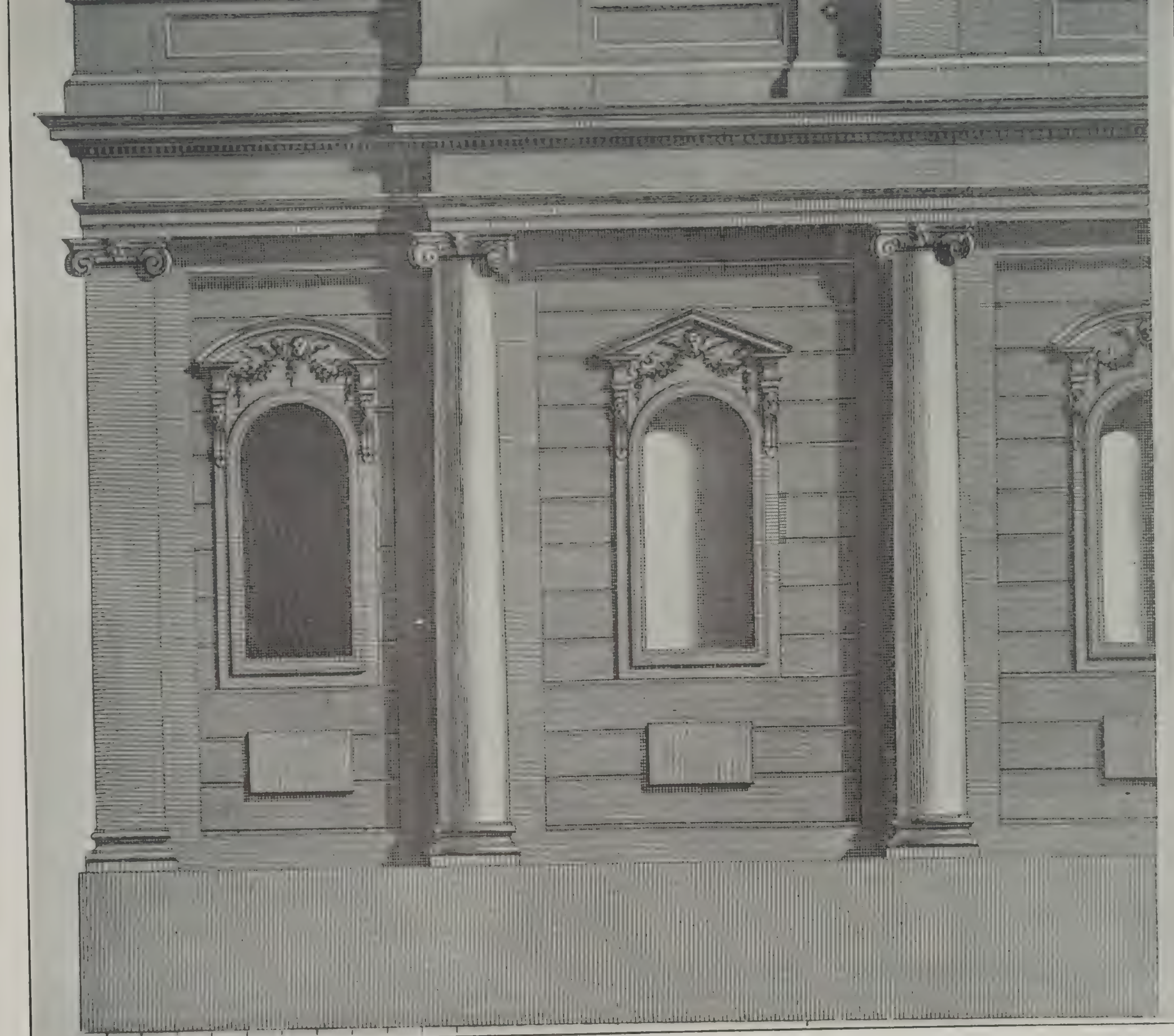
E. KNAPTON, builder, New Malden. R.O., Dec. 21.

H. G. HEAL, builder, Worthing and Littlehampton. R.O., Dec. 20.

W. SHIPLEY, builder, Sparkbrook and Moseley. R.O., Dec. 18.

J. T. BULMER, builder and joiner, South Bank. P.E., Midlesbrough C.C., Jan. 10, at 10.30. R.O., Dec 17.

E. A. PAGE, builder, London. Liabilities, £2,712; assets, £517; dividend, 2s. 4d. in the £.



Scale of feet.

THE CHURCH OF ST. MARY·LE·STRAND, LONDON: DETAIL OF SOUTH FRONT. JAMES GIBBS, ARCHITECT.

THE BUILDERS' JOURNAL
AND ARCHITECTURAL ENGINEER

Notices.

Offices: 6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 2200 Holborn (6 lines).

Date of Publication: The Builders' Journal and Architectural Engineer is publisheed every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The "Contractors' Section," is given in this issue.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Braneh." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

The Wellington Memorial.

Another stage in the long history of the Duke of Wellington's memorial in St. Paul's Cathedral has been reached by the placing in position of the completed plaster cast of the equestrian figure needed to crown the work. It will be recollected that in 1903 a private committee acquired Alfred Stevens's full-size plaster model of horse and rider which had lain in the crypt, and after piecing the work together (the head of the "Iron Duke" having previously been sawn off by Mr. Hugh Stannus in order to preserve it safely) took steps for the ultimate completion of the statue. They selected Mr. John Tweed as the sculptor to add the missing parts—in particular the horse's tail and one of the hoofs—and to do such surface finishing as was obviously needed. At the time, there was much outcry in certain quarters, but eventually Mr. Tweed was allowed to go on with the work allotted to him. The figure, now finished, has been set up in position for a few weeks so as to enable its effect to be judged; it will subsequently be cast in bronze. So far as one can see in the bad light at this time of year, we certainly think Mr. Tweed has carried out his work in a capable manner, and as we look on it we can but wonder that the memorial should so long have remained unfinished, in mere perpetuation of Dean Milman's unjust refusal to have the Duke or any other soldier "to come riding into the Cathedral." It was Lord Leighton who prevailed upon the authorities to remove the memorial out of obscurity and to set it under one of the arches on the north side of the nave. This was the best position that could have been chosen, but it is not an ideal position by any means, as, owing to the light from the large windows on the north side, there is only one point of view from which the memorial can be adequately seen, namely, from the bay on the south side of the nave nearest the crossing.

The So-Called "Honorary Advising Architect."

In a very able inaugural address recently delivered by the incoming president of one of the largest of the provincial societies allied to the Royal Institute, its author drew attention, *inter alia*, to some of the many evils resulting from the employment of so-called honorary advising architects. A case was instanced in which the president's plans and estimate for some small additions to a vicarage were sent for approval to a certain society in London, accompanied by the customary request for a monetary grant towards the proposed outlay. The society's secretary, in reporting to the client that his society would make the grant applied for, stated that their "hon. advising architect" had reduced the acting architect's charges to £2 2s., this amount being sufficient, in their hon. adviser's opinion, for a complete survey of the building and one-eighth scale plans of two floors and elevations and a set of tracings! Now, as the speaker expressed it, the hon. advising architect, in London, probably knew "no more than the man-in-the-moon" how much time had been expended in travelling to the remote vicarage before it could be surveyed, and it so happened that, in this particular instance, the travelling and surveying alone involved a long day's work, to say nothing of the time expended subsequently upon the drawings and tracings. We are glad to hear that the acting architect sent a strong protest to the society, pointing out how unfair it was for their hon. advising architect (without troubling to ascertain the facts of the case) to lead the client to believe that an unreasonable charge had been made for the work in question, and suggesting that the account should be brought under the notice of the Institute, or of any other recognised architectural society. Although the acting architect was obliged to let the matter end here, as he felt himself unable to enter into a conflict with a somewhat important society, it is only fair to the latter to say that its secretary admitted that they had already had complaints from the R.I.B.A. as to similar transactions! The fact is, gratuitous professional services are generally useless, or worse than useless. The honest architectural labourer is well worthy of his hire, and if an architect is not properly and openly paid for his work it is unlikely that he will always give to it the care and close attention which is necessary. How can any reasonable person expect it to be otherwise?

The Dome of St. Paul's.

Mr. William Woodward, F.R.I.B.A., writes a letter to the "Evening Standard" in which he says that the stone lantern of St. Paul's Cathedral weighs about 700 tons, being carried by the upper part of the unseen brick cone that passes between the inner cupola and the outer dome. "There can be little doubt that Sir Christopher Wren appreciated the mistake which had been made at St. Peter's, Rome, by the construction of the only dome which, however impressive and effective when viewed from the inside of the cathedral, entirely loses its grace and importance when seen from the outside. Sir Christopher, therefore, used his constructive genius in securing three important features at St. Paul's—the 'cone,' which takes its rise from the haunches of the inner cupola; the 'cupola,' which is of exquisite curve, and within visual range when viewed from the interior; and the 'dome,' which is equally effective when seen from the exterior. To give some idea of the difference in rise between the cupola and the dome, it may be mentioned that the height from the top of the cupola to the top of the dome is 53ft., so that it can readily be imagined what the effect would have been if Sir Christopher had copied St. Peter's. It is delightful to find this renewed public interest in the finest protestant cathedral in the world, and if the clamouring to retain the mutilated Crosby

Hall should cease, to what better purpose could the subscriptions be applied than in proceeding with the mosaic decorations which have been stopped for want of funds, and fittingly finish that cupola which is the masterpiece of our greatest architect." We scarcely think Mr. Woodward can be serious in his suggestion that the fund subscribed by the public with the specific object of preserving Crosby Hall should be applied for the completion of the mosaic decorations of St. Paul's. We are sure there would be numerous objectors to the proposal should it ever be officially put forward, to say nothing of the fact that those who are entitled to speak with authority on the subject are divided in their opinion as to the artistic value of the decorative work already carried out.

H.M. Office of Works and Reinforced Concrete.

A very interesting correspondence between H.M. First Commissioner of Works and the Royal Institute of British Architects has been published in which the former invites the opinion of the latter on the durability of reinforced-concrete structures, and the attitude of the Local Government Board when fixing the period for the repayment of loans on buildings erected in this material. Many of our readers have no doubt observed that the Local Government Board has been hostile to this modern method of construction, and has restricted the loan period to shorter dates than those usually permitted for structures of brick and stone. The carefully-considered and exhaustive reply sent to the First Commissioner by the secretary of the Royal Institute declares unequivocably in favour of reinforced concrete, and expresses the view that there is no reason for the attitude assumed by the Local Government Board. It is to be hoped, therefore, in the face of this opinion, that the Local Government Board authorities will no longer stand in the way of the development of a method of construction which tends in the direction of greater durability and economy in our public works.

The Ventilation of the New Central Criminal Court.

We are glad to see Mr. E. W. Mountford, the architect, replying to the criticisms which have been made (mostly in a flippant unfair way) on the system of ventilation installed at the new Central Criminal Court. Mr. Mountford says that if the apparatus were properly regulated there would be little cause for complaint. "The system adopted," he remarks, " is as near perfection as anything I know of. The great advantage of the system is the frequency with which the air is changed. Before it can get foul it is hustled out by fresh air. This happens twelve times every hour. The air which is brought in from outside is put through various processes. Entering a room in the basement, it passes through a screen made of hemp and a brown canvas-like material, upon which jets of water are constantly playing. It then passes through a second screen composed of glass tubes, which suck up any remaining impurities. Next it goes into a second chamber, where it is warmed by the agency of hot-water pipes, stretching from floor to ceiling. Entering a third room, it is caught by six big electric fans and circulated all over the building through specially constructed flues. Finally it flows into the various courts through oval gratings near the ceilings, forcing out the impure air through gratings near the floor. In order to ensure the proper working of the system, it is necessary that the fans should be kept continuously going. As a matter of fact, however, the apparatus has lain idle over Sunday. The windows should also be kept closed, but they have not infrequently been opened." To an architect who has had practical experience of the particular method of heating and ventilation adopted at the new Central Criminal Court, Mr. Mountford's remarks are sufficiently convincing. Unfortunately, in common with all mechanical systems, that known as the "plenum" has its drawbacks, but for many classes of buildings it is at least as good and efficient as any in vogue.

Criticism from America.

When reviewing the English building and architectural journals, our esteemed contemporary "The Architectural Review" of Boston, U.S.A., rarely misses the opportunity of saying something caustic about English architecture, in particular the architecture of our public buildings. Occasionally, however, we are granted some admixture of sweet with the bitter, and it was evidently in one of his softer moods that the critic wrote the notices in the last issue which has reached us from the other side. Pointing to the new clock tower which has been erected on the site of the Obelisk at St. George's Circus, London, he describes it as "about as lacking in elements that are either monumental or beautiful as might occur in the least civilised of communities, instead of having unexpectedly materialised in this centre of civilisation. One wonders how it happened." Mr. Hare comes in for gentler treatment, his United Kingdom Provident Institution building being described as "an example of a clever and effective use of sculpture, even if the taste displayed is not always impeccable." And in Westminster Cathedral we have the critic at last on his knees; for, though the new high altar and baldachino (by the late Mr. Bentley) is spoken of as being "almost too theatrical for its purpose," albeit "startlingly original and unquestionably impressive," the side altar in the Chapel of SS. Augustine and Gregory, with its reredos and decoration, is "quite wonderful in its mingling of Byzantine and modern qualities. Nothing better than this harmony of marble and mosaic has been achieved in recent times." Not even in America?

THREE FAMOUS STEEPLES BY JAMES GIBBS (1682-1754).

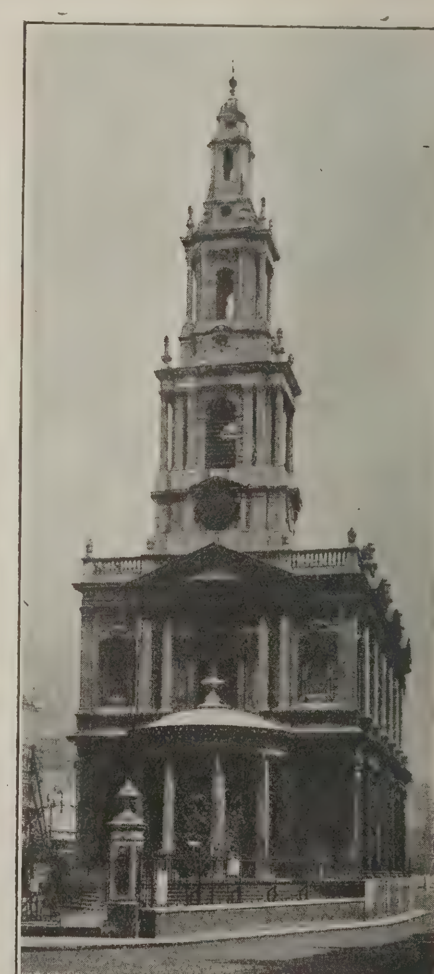
In the well-known "Book of Architecture" by James Gibbs, the second edition of which was published in the year 1739, its author, one of the most successful practitioners of the school of architecture instituted in England by Sir Christopher Wren, gives a series of very complete illustrations of his designs for churches and steeples, including those of St. Mary-le-Strand, St. Martin's-in-the-Fields, and St. Clement Danes. In his description of these plates Gibbs makes the following remarks:—

"Steeples are indeed of Gothick extraction, but they have their Beauties when their Parts are well disposed and when the Plans of the several Degrees and Orders, of which they are composed, gradually diminish and pass, from one Form to another, without confusion and when every Part has the appearance of a proper Bearing."

From the above statement it would appear, therefore, that the author's opinion of the dominant idea which should govern and influence the designer of church steeples was quite in accordance with the precepts and practices of his great predecessor, Wren.

The motif usually underlying the designs of each master was the piling up, one above the other, of a series of more or less open stages, generally embellished with orders and entablatures, which diminished in size, both horizontally and vertically, the higher they were placed in the composition.

Charming effects of light and shade were often thus obtained, owing to the juxtaposition of varied profiles and wall



THE CHURCH OF ST. MARY-LE-STRAND.

surfaces, resulting from the super-position of stages of masonry of contrary curvature, or shape to those forming their bases or supports.

Good outlines were also gained by forming successive stages of regular or irregular, polygonal, or other geometrically-planned structures, placed upon a square base, the greatest care being taken to rigorously maintain, in each stage, the same relative proportion of solid to void. Whilst, unlike Wren, Gibbs did not possess a vast amount of creative genius, yet his architectural scholarship was profound; he appears, moreover, to have been a man of very considerable general culture, and in his designs for steeples he proved himself to be almost the equal of his great predecessor. He, however, made the mistake, which Wren was always careful to avoid, of not sufficiently emphasising the lower portions of the vertical lines of his towers, which, consequently, often appear to merge into porticoes or other features.

Among his designs for spires which we here reproduce are those made for the church of St. Mary-le-Strand, of which Figs. 1 and 2 represent the executed design, and Figs 3, 4, 5, 6 and 7 the architect's studies, or, as he terms them, "draughts," for the same feature.

With respect to this church, and to the difficulty, as regards the tower, with which he had subsequently to contend, Gibbs gives us the following information:—

"The new Church in the Strand, called S. Mary-le-Strand, was the first Publick building I was employed in after my arrival from Italy; which being situated in a very Publick place, the Commissioners for building the 50 Churches* (of which this is one), spar'd no cost to beautify it. It consists of two Orders in the upper of which the lights are placed; the Wall of the lower being solid to keep out noises from the street, is adorned with niches."

As to the design for the steeple, with which we are for the present especially concerned, Gibbs gives the following interesting account of how his clever and very unusual treatment of the tower was brought about:—

"There was at first no steeple designed for the church—only a small *Campanile*, or Turret for a Bell was to have been over the West end of it. But at the distance of 80 ft. from the West Front there was a column 200 ft. high intended to be erected in Honour of Queen Anne on the top of which her statue was to be placed. My design for the Column was approved by the Commissioners and a great quantity of stone was brought up to the place for laying the Foundation of it, but the thought of erecting that Monument being laid aside upon the Queen's Death, I was ordered to erect a steeple instead of the *Campanile* first proposed. The Building being then advanced 20 ft. above ground and therefore admitting of no alteration from East to West, which was only 14 ft., I was obliged to spread it from South to North, which makes the plan oblong, which otherwise should have been square."

Gibbs obtained the necessary "spread" from south to north, to which he alludes, by the clever expedient of placing detached columns, standing clear of the north and south walls of the structure, and ensuring the necessary continuity of design by attaching pilasters to its east and west faces. This happy solution of the problem resulted in the erection of the exceedingly well-designed and graceful steeple with which many of us are so familiar.

*Under an Act of Parliament dated 1708.

Fig. 1.—West Elevation.

Fig. 2.—South Elevation.

THE STEEPLE OF ST. MARY-LE-STRAND.

In 1719 Gibbs was commissioned to complete Wren's work at St. Clement Danes by the addition of the steeple (Fig. 8), raised upon an existing foundation.

By far the most successful of his church spire work, however, is the beautiful spire of the Church of St. Martin-in-the-Fields.

Figs. 9, 10 and 11 represent three of the many studies made by Gibbs for this fine feature and Fig. 12 is an elevation of the exquisite spire that was eventually constructed.

Although all the designs are good of their kind, there is no doubt that the beauty, charm and variety apparent in the detail of each stage of the one finally selected for execution are not less noteworthy than is the graceful harmony of the whole composition. Indeed, it is doubtful whether even Wren could have produced a more effective design.

Gibbs appears to have made three designs for this church—two of which were for circular galleried structures of about 95 ft. diameter; the third design, which is very fully illustrated in his book, being the one ultimately selected for execution. The foundation-stone of the structure was laid on March 19th, 1721.

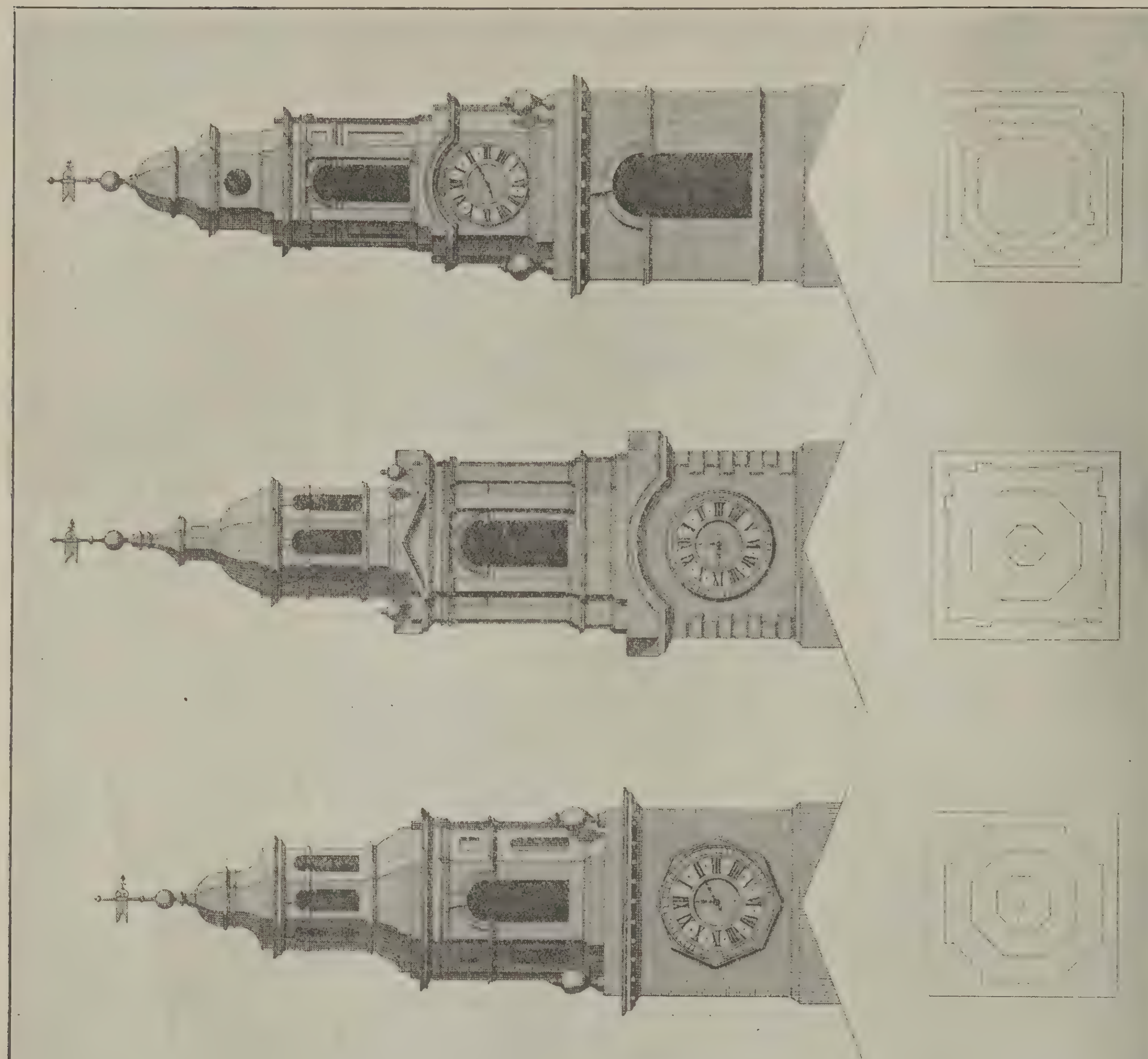
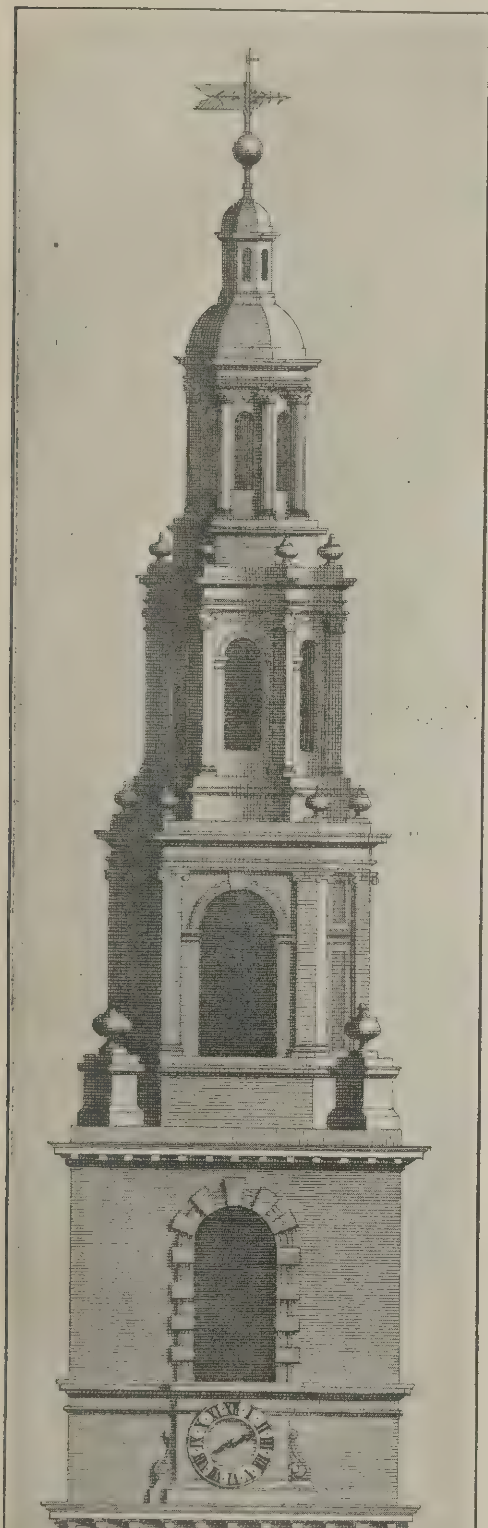


Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.

GIBBS'S "DRAUGHTS" FOR THE STEEPLE OF ST. MARY-LE-STRAND.



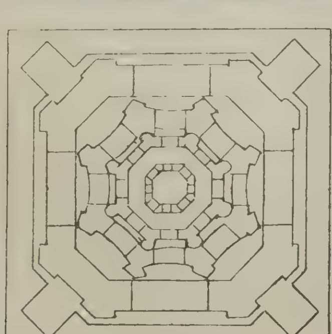
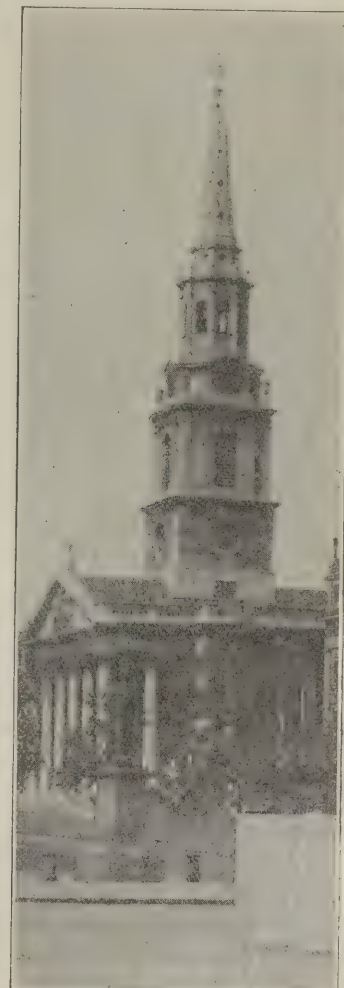
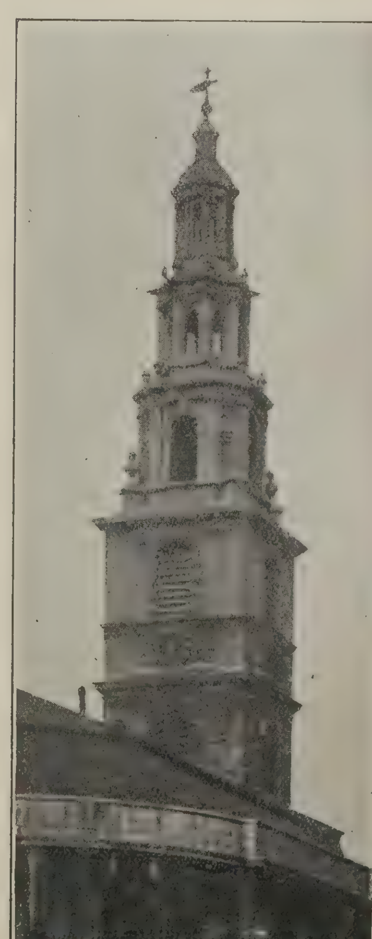


FIG. 8. THE STEEPLE OF ST. CLEMENT DANES CHURCH, STRAND, LONDON.



ST. MARTIN'S-IN-THE-FIELDS.



ST. CLEMENT DANES.

FIG. 12. ST. MARTIN'S-IN-THE-FIELDS: WEST ELEVATION OF STEEPLE.

Fig. 9. Fig. 10. Fig. 11.

THREE OF GIBBS'S "DRAUGHTS" FOR THE STEEPLE OF ST. MARTIN'S-IN-THE-FIELDS.

MODERN ENGLISH CHURCH WORK.

The January issue of the "Architectural Review" brings together a most interesting collection of modern English church work. This includes St. Mary's, Eccleston, and additions to Cowley Church, Oxon., by the late Mr. Bodley; Christ Church, Port Sunlight, by Messrs. Wm. and Segar Owen; the Chapel at Holy Cross Home, Haywards Heath, by Mr. Walter E. Tower; St. Martin's, Wonersh, by Mr. C. Harrison Townsend; St. Swithin's, Hither Green, by Mr. Ernest Newton; Ullet Road Chapel and Hall, Sefton Park, Liverpool, by Messrs. Thos. and Percy Scott Worthington; the choir at Downside Abbey, near Bath, by the late Mr. Thomas Garner; St. Erkenwald's, Southend-on-Sea, by Mr. Walter J. Tapper; Christ Church, Brixton, by Prof. Beresford Pite; and the Baptist Church House and Kingsway Chapel, by Mr. Arthur Keen.

In addition the issue contains a most interesting (and hitherto unpublished) letter on spires and towers by Welby Pugin; Part I. of an authoritative article on "The Principles of Dome Construction," by Mr. William Dunn; the second part of Mr. T. Frank Green's article on "Morden College, Blackheath" (illustrated by photographs and measured drawings); the concluding article to the series on "Modern Leadwork" which Mr. Lawrence Weaver has been contributing to the "Review"; illustrations of the Norwich Union Life Insurance Society's head offices, at Norwich, the architects of which were Messrs. G. J. and F. W. Skipper; and several very informative notices of new books.

Altogether it is a particularly good issue, and should be in the hands of all architects.

Notes on Competitions.

New Municipal Buildings, Hertford.

For the new buildings to be erected at Hertford, ninety-eight designs were submitted, the first premium (£50) being awarded to Mr. Charles Carter, architect, of Nottingham, and the second premium (£20) to Mr. R. Palmer Baines, of London.

Acton Municipal Buildings.

The Acton District Council met on Thursday last to consider Mr. Norman Shaw's award in the second competition for the proposed new municipal buildings. Mr. Shaw placed designs Nos. 26, 6 and 34 as first, second and third. A report by the Surveyor stated that, reckoning the cost of the work at 11d. per cubic ft., the amounts came to £22,011, £24,098, and £20,269 respectively. Councillor Eydmann moved a resolution that no designs be considered which would exceed £18,000, that being the sum to which the majority of the council were pledged. After a long discussion, the chairman moved a resolution that the three designs selected be referred to the surveyor to obtain satisfactory evidence that their cost would come within the amount stipulated. This was agreed to.

A New Municipal Building for New York.

The following thirteen firms of architects have been selected to compete for a new municipal building to be erected in New York at an estimated cost of about £1,250,000:—J. Stewart Barney, Carrere and Hastings, Clinton and Russell, J. H. Freeland, Cass Gilbert, Hines and La Farge, Helmme and Huberty, Hoppin and Koen, Howells and Stokes, H. R. Marshall, McKim, Mead and White, Trowbridge and Livingstone, and Warren and Wetmore. Each firm will receive £200, and the successful competitor will be paid £1,000 in the event of the building not being proceeded with; otherwise he will carry out the work and receive the ordinary percentage. The assessors will each receive £200. Designs have to be sent in by April 15th next, and the award must be made known by May 14th.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
Jan. 13	STATUE AT WIGAN to Sir Francis Sharpe Powell, Bart., M.P. Models and sketches. Premiums £50 (to merge), £15 and £10. Conditions from Harold Jevons, Town Clerk's Office, Wigan. Summary in BUILDERS' JOURNAL, November 13th.
Feb. 1	BRANCH BATHS AT ROCHDALE (to cost £7,500).—Premiums £25, £15 and £10. Assessor will be appointed. Conditions from S. S. Platt, Borough Surveyor, Rochdale. Deposit 10s. 6d.
Feb. 1	SECONDARY SCHOOL FOR BOYS AT MAIDENHEAD.—Premiums £100, £50 and £25. Assessor to be nominated by President of R.I.B.A. Conditions from the Secretary, Berkshire Education Committee, The Forbury, Reading. Deposit 5s. Summary in BUILDERS' JOURNAL, December 11th.
Feb. 1	CITY HALL AT PERTH.—To cost £25,000. Premiums £50, £30 and £20. J. J. Burnet, A.R.S.A., F.R.I.B.A., Assessor. Deposit, One Guinea.
Feb. 15	MUNICIPAL BUILDINGS AT SHANGHAI. — Conditions, together with site plan, may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.
Feb. 17	NEW COUNCIL OFFICES, &c., AT RADCLIFFE.—Limited to architects in Lancashire. Assessor, Mr. G. H. Willoughby, F.R.I.B.A. Premiums £75, £50, and £25. Conditions from S. Mills, clerk, Council Offices, Radcliffe, Manchester.
No Date	ADMINISTRATION OFFICES AT PONTYPRIDD, for the Guardians.—Conditions from William Spickett, Clerk, Union Offices, Pontypridd, on or before January 31.
No Date	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1.

Our Plate.

St. Mary-le-Strand, London: Detail of the South Front.

Amid the publication of so much modern work—much of it of very little architectural quality—we think it worth while to give some examples of old work, and the detail of the Church of St. Mary-le-Strand is the first of a series of such reproductions which we propose to publish. The work that Gibbs did in this church is truly magnificent. His proportions are most carefully considered, and the detail is appropriate and refined; the whole treatment exhibiting a facility of classical design which very few architects now possess. We have only to walk along the Strand and to compare this beautiful building with the modern erections in its vicinity in order to appreciate how very much nobler is Gibbs's achievement. Some particulars of the work will be found in the article in this issue dealing with the steeples of St. Martin's, St. Mary's and St. Clement Danes, which stand as monuments to the ability of one of our greatest architects.

AN EXCELLENT BOOK ON HOUSING.

One of the most valuable books published in recent years upon the housing problem was the "Housing Handbook," by Alderman W. Thompson, of Richmond, Surrey. He has now published a companion volume, "Housing Up-to-date," which brings the facts and figures as published, in 1903, in the former work, up-to-date. Since that time, though not much has been added to change Mr. Thompson's views of the nature of the problem, and the principles upon which progress can be made, a good deal of additional work has been done, and several interesting experiments have been carried out which it is well to have recorded in a convenient form such as this. The text of the Housing Acts of 1903, with explanatory notes and the most recent circulars formed from instructions arranged by the Local Government Board, are contained in an appendix to the work.

"Housing Up-to-Date." Supplement to the "Housing" Handbook. By Aldn. W. Thompson, Chairman, National Housing Reform Council. London: National Housing Reform Council, 432, West, Strand, W.C.

Notes and News.

A STAINED-GLASS WINDOW, with St. George as subject, has been placed at the east end of the south aisle of Woolhope Church, Herefordshire. It was designed and executed by Mr. H. G. Murray, of Britannia Studio, Caroline Street, Westminster.

* * *

MR. W. AUGER SMITH announces that after eleven years as chief assistant and manager to Mr. Arthur Marshall, A.R.I.B.A., of Nottingham, he has commenced practice as an architect and surveyor at Russell Chambers, King Street, Nottingham.

* * *

THE WALDORF HOTEL on Aldwych, London, is to be opened on January 22nd. It has cost £400,000. Messrs. A. Marshall Mackenzie and Son are the architects, and the Waring White Building Co., Ltd., the general contractors. Messrs. Waring and Gillow, Ltd., have carried out the decoration, furnishing and equipment.

* * *

COLLAPSE OF TEIGNMOUTH PIER.—On Saturday morning last the entrance end of the promenade pier at Teignmouth collapsed, with the pavilion and shops, the tide having undermined it. The wall protecting the "Den" has been washed down, and the asphalt promenade has given way. The lighthouse foundations are also becoming undermined.

* * *

NEW PUBLIC BATHS AND WASH-HOUSES AT PLUMSTEAD were opened on Wednesday last. They have been erected from designs by Mr. J. Rush Dixon, M.I.C.E., engineer and surveyor to the Borough of Woolwich. All the bath fittings have been supplied by Messrs. Doulton and Co., Ltd. The valves are of a special combined pattern which allow the water to be regulated to any temperature; possibility of scalding, however, is prevented. A full description of the valves was given on page 341 of our issue for December 4th, in connection with the opening of the new public wash-houses erected last year in Lime Grove, Shepherd's Bush, by the Borough of Hammersmith.

FRENCH BUILDERS' DEMANDS. — At the congress held at Lille just before Christmas, the building trade syndicate, which includes navvies, masons, stone-cutters, carpenters, plumbers, etc., formulated the following desiderata :—(1) The creation of labour inspectors, appointed by the syndicate, but paid by the State; (2) that contractors be prohibited from employing more than 10 per cent. of foreign workmen; (3) recognition of the collective labour contract and the suppression of the individual signature; (4) free postage for the syndicate; (5) that masters be bound to take back their sick or injured workmen on recovery.

* * *

THE ULSTER SOCIETY OF ARCHITECTS AND THE R.I.B.A.—The annual general meeting of the Ulster Society of Architects was held last week. The Right Hon. Robert Young, J.P., was elected president for the ensuing year, with Mr. W. J. Gilliland, F.R.I.B.A., as vice-president. Among the matters referred to in the annual report of the Council was the desired alliance of the Society with the Royal Institute of British Architects, which is not yet accomplished, "owing mainly to the persistent opposition on the part of the Royal Institute of the Architects of Ireland. Your council has continued, however, to press the claims of the Society on the British Institute, and has pointed out the anomalous position taken up by the latter, inasmuch as it entrusts the conduct of its examinations for all Ireland to your Society, and at the same time maintains that the time is not yet ripe for alliance. It rests with the members to consider whether an alliance with some other architectural body might not be more advantageous to the Society than to continue to remain unassociated with any central professional organisation."

Obituary.

MR. JOHN BLEZARD, head of the firm of Blezard and Sons, builders and contractors, of Clitheroe, died on December 30th, aged 56.

MR SAMUEL STONE, head of the firm of Messrs. Samuel Stone and Sons, builders, and contractors, Sheffield, died recently, aged 85.

MR. DAVID MORGAN, of the firm of Messrs. D. Morgan and Sons, builders' merchants, of Cardiff, died on December 24th, aged 64. For several years past deceased had been an invalid, and the business had been entirely controlled by his eldest son, Mr. Arthur Morgan. Consequently, no difference will be made so far as the business is concerned, Mr. Arthur Morgan, assisted by his brother, conducting the same as hitherto.

CALENDARS AND DIARIES.

The Bromsgrove Guild, of Bromsgrove, Worcestershire, have established a reputation for sending out what may fairly be called one of the most artistic calendars issued by any firm, and their calendar for 1908 is certainly as good as, if not better than, anything they have hitherto done in this direction. It consists simply of a dark-green mount having a beautiful bronzed medallion of "The Nativity," and the calendar itself attached below.

Another attractive calendar has reached us from Messrs. James Duthie and Co., of 129, St. Vincent Street, Glasgow, sole agents for "Duresco," in Scotland and Ireland. This is embellished with a mediæval subject picture from "Dream Days" (by permission of Mr. John Lane), exceedingly harmonious in colouring and decorative in treatment.

The Crittall Manufacturing Co., Ltd., of 11 and 12, Finsbury Square, E.C., send us a calendar which shows some decorative line drawings and lettering, in excellent taste.

We have also to acknowledge the calendars sent to us by Messrs. Pinchin Johnson and Co., Ltd., the well-known varnish, colour and paint manufacturers, of Minerva House, Bevis Marks, London, E.C.; Messrs. Arthur L. Gibson and Co., of 19-21, Tower Street, Upper St. Martin's Lane, W.C., whose calendar is embellished with a delicately-coloured reproduction of a picture, by the American artist Edward Lamasure, entitled "In Old Kentucky"; The Remington Typewriter Co., of 100, Gracechurch Street, London, E.C. (who also send us a pocket diary for 1908); and Mr. Harrison Ainsworth, of 197, The Grove, Hammersmith (office for photo-prints, drawings, tracings, typewriting, etc.).

From Messrs. Tom W. Smith and Co., timber merchants, importers of American and Swedish doors, mouldings, etc., we have received a handy little book with sizes and prices of newels, balusters, doors, etc., printed on the insides of the cover, and with calendars for 1908 and 1909 on the back of the cover.

Correspondence.

The Building Trades and the Architectural Profession in Vancouver.

To the Editor of THE BUILDERS' JOURNAL.

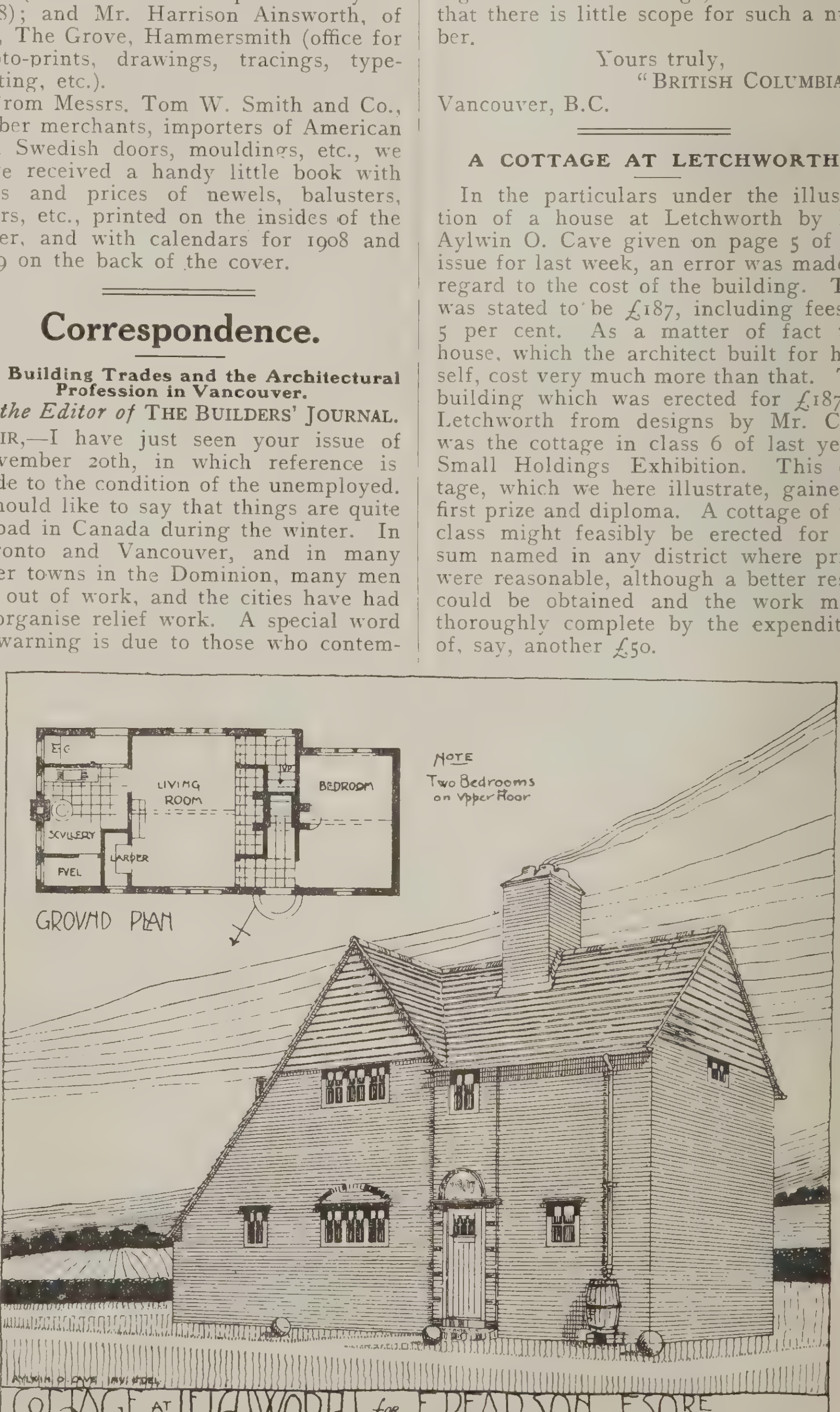
SIR,—I have just seen your issue of November 20th, in which reference is made to the condition of the unemployed. I should like to say that things are quite as bad in Canada during the winter. In Toronto and Vancouver, and in many other towns in the Dominion, many men are out of work, and the cities have had to organise relief work. A special word of warning is due to those who contemplate coming to British Columbia. Employment on the land is almost always certain, but employment in the cities, especially for those in the building trades, is very uncertain. In the winter time all the unemployed from the eastern towns flock to Vancouver, which, though it has no winter as the Canadians understand it, has a rainy season that stops outdoor work almost as effectively as frost. Though the city of Vancouver is growing, there is no scope for English architects. I know well-qualified men who had to work as stone masons, plasterers, and even as general labourers during the summer. Vancouver is practically the only city in the province, and many men have come here from San Francisco and other cities in the States. With a population of about 75,000, I believe, there are about 30 practising architects, and when it is remembered that nearly all the dwellings are frame buildings, it will be seen that there is little scope for such a number.

Yours truly,
"BRITISH COLUMBIA."

Vancouver, B.C.

A COTTAGE AT LETCHWORTH.

In the particulars under the illustration of a house at Letchworth by Mr. Aylwin O. Cave given on page 5 of our issue for last week, an error was made in regard to the cost of the building. This was stated to be £187, including fees at 5 per cent. As a matter of fact this house, which the architect built for himself, cost very much more than that. The building which was erected for £187 at Letchworth from designs by Mr. Cave was the cottage in class 6 of last year's Small Holdings Exhibition. This cottage, which we here illustrate, gained a first prize and diploma. A cottage of this class might feasibly be erected for the sum named in any district where prices were reasonable, although a better result could be obtained and the work made thoroughly complete by the expenditure of, say, another £50.



AYLWIN O. CAVE, ARCHITECT.

Enquiries Answered.

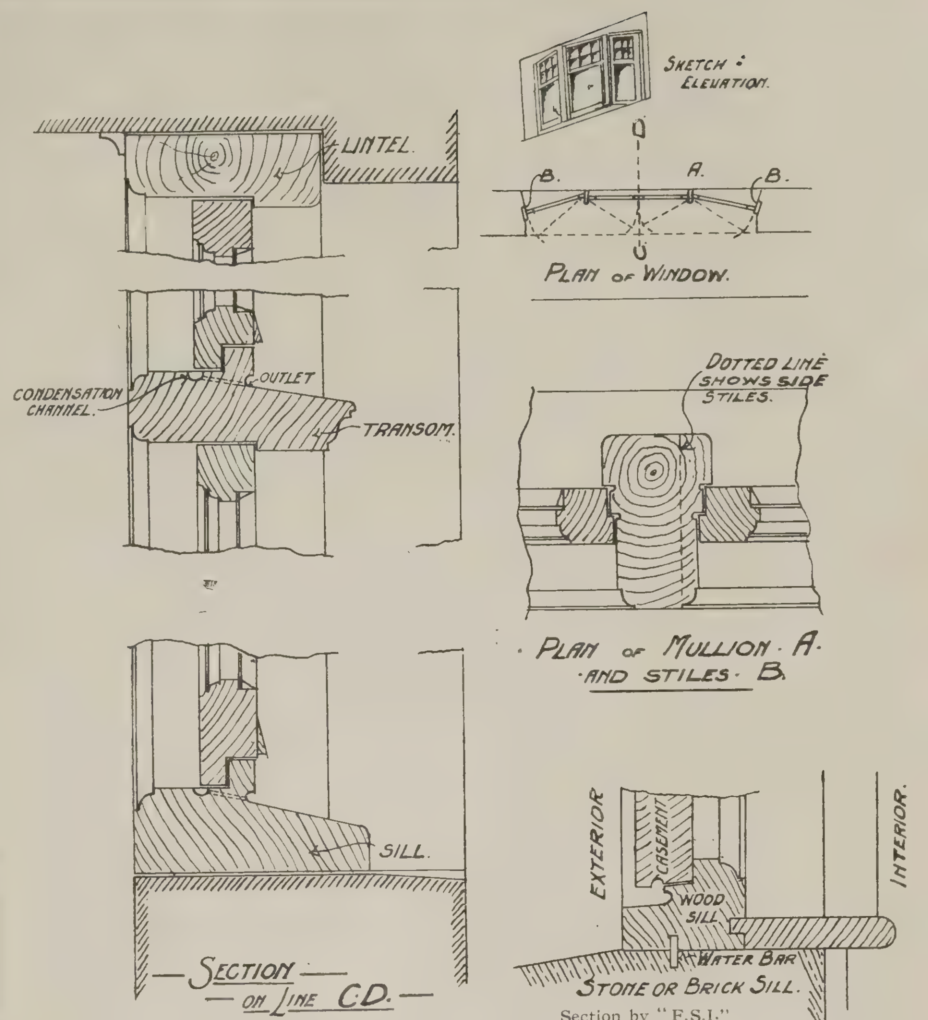
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

Window Construction.

EDMD.—F. H. writes: "I shall be glad to have your opinion on the construction for window shown by the accompanying sketch. Whenever there is a shower of rain the water gets into the rooms in considerable quantities. What do you think is at fault, and which is the cheapest way of remedying the defect?"

The drawing you send shows a very good type of casement window, and I can only suggest a water bar should be inserted between the wooden sill and the wall below. Personally I much prefer that casements should open outwards, as I believe there is then less chance of water entering by suction at the joints. I construct such a casement as drawn in vertical section on the accompanying sketch, making the light overhang the sill, as there shown.

F.S.I.



WATER-TIGHT CASEMENT WINDOW.

Architectural Models.

LONDON. — L.B. writes: "I wish to make a small model of a building from some measured drawings. Which is the best way of doing this, and what materials are usually employed?"

Particulars of architectural models have been published in our columns on several occasions; the following, however, may be given in answer to your enquiry:—Models can be made in cardboard, wood or plaster, the simplest material being cardboard. The elevations should be drawn on the cardboard and then inked in, such portions as windows, doorways, etc., which are drawn on another thickness, being cut out. The whole is then carefully coloured and cut up, care being taken to bevel the corners, so as not to show a square joint. The pieces can then be stuck up with glue on a rough wood frame, or small pieces of wood or cardboard can be put crossways inside as struts and at angles for strengthening. Roofs may be made of plain cardboard and paper ruled to imitate slates or tiles (as the case may be) and pasted on afterwards. Chimneys, window sills, downpipes, etc., should be cut out of solid wood and painted. Green cloth and dyed sponge are good substitutes for grass and trees, whilst portions required to be gravelled should have a coat of strong gum, which is dusted over with fine sand whilst wet.

Work to Measure around London.

LONDON. — X. writes: "I should be much obliged if you could tell me of some good Decorated or Perpendicular churches for measuring in north-west London, or a little way out of London in that direction."

It is necessary to travel beyond the suburban fringe of north-west London before finding any examples of the Decorated or Perpendicular styles which may be usefully studied. North Mimms church, Hertfordshire, has some excellent Decorated work; the west doorway would be very suitable for measurement. Ruislip and Aldenham churches in Middlesex are chiefly Perpendicular, and a window or similar detail, or a portion of the ancient screenwork in the latter church (note that there is much *modern* woodwork), could be advantageously measured. Either church would also make a fine set of drawings if measured completely.

G.

LONDON.—A.E.B. writes: "Could you suggest a Renaissance building, suitable to measure for probationship, Royal Academy; also a Decorated or Perpendicular building for R.I.B.A. Intermediate; in or near London?"

Such buildings as Morden College, Blackheath; St. Benet's Church, Upper Thames Street; Hampton Court Palace; or the Brewers' Hall, Addle Street, E.C., would afford ample opportunity for measurement and profitable study. The Orangery, Kensington Palace, is also justly a great favourite with students. Almost every such building near London worth measuring has, of course, already been measured more than once. Some good Perpendicular work may be found in the Church of All Hallows, Barking (by the Tower of London), where a bay of the choir arcade would be suitable for measurement. Of Decorated work in London, there is very little, except at Westminster Abbey, where permission to measure is not readily granted, and St. Etheldreda, Ely Place, where it is altogether refused, but see answer to X.

G.

The Orders.

STOCKPORT. — PROBATIONER writes: "Please mention some of the best works on the Orders of architecture, and their prices. I need them for drawing my testimonies of study from for the Intermediate R.I.B.A."

For the purpose of preparing testimonies of study for the R.I.B.A. Intermediate examination, the books named in the R.I.B.A. Kalendar will be found suitable. Those dealing with the Orders are "Normand's Parallele des Ordres," Mauch's "Der Architektonischen Ordnungen," and R. Phené Spiers' "Orders of Architecture": the last, which is based on Normand and other authorities, is published by Mr. B. T. Batsford, 94, High Holborn, price 10s. 6d. Bearing in mind the purpose of the drawings as testimonies of *study*, however, it is preferable not to make direct copies of published drawings, but to set up examples from figured surveys of the buildings, such as that of the Parthenon in Penrose's Principles of Athenian Architecture, or the Erectheion in Inwood's book.

Colouring a Cement Swimming Bath.

FILEY.—R.W.S. writes: "Please state what composition of light colour would be suitable for putting on the sides and bottom of a bare concrete swimming bath, the object being to improve the appearance of the water."

It is a difficult matter to obtain a pigment that will stain Portland cement a light colour without weakening its character. One-third powdered chalk, and sulphate of barytes, have been recommended, but both of these reduce the value of the cement considerably. A better plan is to use one-third or more of Portland stone dust (quite clean) to two-thirds of Portland cement, or a greater proportion of dust may be employed. This gives a light grey tint. Portland stone dust is one of the best materials for mixing with cement and is quite harmless.

T.P.

CONTRACTORS' SECTION

(MONTHLY).

THE HOME OFFICE REPORT ON BUILDING ACCIDENTS.

And Some Criticism of it.

In the leader columns of our issue for last week we referred to the salient points of the draft regulations for the conduct of building operations embodied in the report which was issued by the Home Office during the Christmas week. We now give the regulations in full, with some criticism (expressing our own opinion) in regard to each clause.

The committee was appointed by Mr. H. J. Gladstone in 1906. It comprised—

Mr. William Dawkins Cramp, I.S.O., Deputy Chief Inspector of Factories.
Mr. John Batchelor (Operative Bricklayers' Society).
Mr. E. T. Jessup (Amalgamated Society of Carpenters and Joiners).
Mr. William Shepherd (London Master-Builders' Association).
Mr. Alexander R. Stenning (Surveyors' Institution).
Mr. G. Macfarlane (President of the National Federation of Building Trade Employers) and
Mr. Dennis Haggerty (General Secretary, United Builders' Labourers' Union); with Mr. Leonard Ward (one of H.M. Inspectors of Factories) as secretary.

The committee have taken nearly 18 months over their deliberations. They held 54 sittings, of which 20 were for the purpose of hearing evidence. Sixty-one witnesses were examined, comprising 18 workmen, 7 working foremen, 30 master builders, 1 constructional superintendent, an architect, an inspector of factories assistant, and the secretary of the Scottish Building Trades' Federation. Eighteen came from London and suburbs, 9 from Lancashire, 4 from Yorkshire, 2 from Newcastle, 1 each from Nottingham, Maidstone and Southampton, 20 from Scotland, and 5 from Ireland—truly a representative list. All trades were represented, both by workmen and employers, and the northern, southern and provincial methods of building were fully explained.

Taken as a whole, the regulations as drafted are excellent, and they deal with the principal dangers that arise. The committee note, however, that, as the law stands at present, any regulations authorised can only apply to buildings on which power is used; but they state their conviction that there is no reason why the rules should not be made applicable to all classes of buildings.

The procedure, according to the Factory and Workshop Act, for the making of regulations is as follows:—

Before the Secretary of State makes any regulations he shall publish notice of his proposal and of the place where the draft regulations can be obtained and of the time, which must not be less than 21 days, during which objections can be sent to him. The Secretary of State shall then amend or withdraw any draft regulation to which objection has been made. If he does not do this and the objection is not withdrawn, or appear frivolous, he shall direct an enquiry to be made by a competent person, who shall report to him. The enquiry shall be held in public and persons affected may appear in person or be represented by counsel or agent. Subject to any alteration the amended draft shall then be dealt with in like manner as the original draft.

We may now proceed to deal in detail with the regulations, which are 46 in number, divided into two parts.

[NOTE.—The draft regulations of the committee are set in large type, and our criticism of them in the smaller type.]

During the construction, alteration, or repair of any building, all contractors and employers of workmen shall observe Part I. of these regulations.

It shall be the duty of all persons employed to observe Part II. of these regulations.

PART I.
DUTIES OF EMPLOYERS.

Scaffolding.

1. Suitable scaffolding plant shall be provided for workmen where necessary and practicable. All scaffolding, and appliances connected therewith, shall be of sound material and of adequate substance. The parts thereof shall be examined before use and during use as to strength and suitability, and if found defective shall be repaired, or if not capable of repair, shall not be used as scaffold plant.

This regulation is in general terms. The first sentence would seem unnecessary, if it were not well known that, especially for trifling operation, scaffolding is often scanty and arranged on the principle that anything will do. The examination of plant before use as to strength is a necessary provision, although no idea is given as to whether the examination should include a test. The examination of plant for strength during its use may prove an awkward matter for the builder, seeing that it could possibly involve the partial demolition of a structure.

2. Sufficient material shall be provided for and shall be used in the construction of scaffolds, and when in place shall not be removed until the part to be removed is no longer required for working purposes, stability, or safety.

This suggestion is an admirable attempt to remedy an evil long known to those engaged in the trade. A weakness occurs in the statement that no part is to be removed until no longer required for working purposes. This would have the effect of causing all timbers once fixed to remain fixed while there was a possibility of further use. What is probably intended is that no part should be removed whilst in use for working purposes.

3. Pole standards shall not be fixed more than 10 ft. apart, and shall be vertical; the ledgers shall be level, and the whole scaffold shall be sufficiently and properly braced. Gabbard scaffolds, frames, standards, or other appliances used as supports for working platforms, shall be of sound construction, and shall have a firm footing, and be adequately secured, strutted and braced.

In this regulation is found the first definite limitation as to the manner in which scaffolds shall be erected. There is much doubt, however, as to its practicability. It is possible that the 10ft. would have to be exceeded at times when scaffolding is over double cartways and similar places: some nice distinctions might also arise (unless interpreted with commonsense) as to when a strut became a standard or otherwise. Although the committee have given this limitation to pole standards, nothing of the same kind is given for standards of square timbers.

4. Working platforms of pole, frame, gabbard, or trestle scaffolds shall be closely boarded or planked and shall be at least 45 ins. wide, and no working platform of pole or gabbard scaffolds shall be less than 5 ft. from the top of the standards, except where impracticable.

The fixing of the width of working platforms at 45ins. certainly gives considerable safety to those working upon them. It is a usual width, but may prove impracticable in such places as narrow wells within buildings. The height of the standards to be 5ft. above the platforms is also wise where guard-rails have to be fixed.

5. Boards or planks forming part of a working platform or run shall be supported at proper distances and at each end by a putlog or other support. Boards of 1½ ins. thickness shall not project more than 6 ins., and planks of 2½ ins. thickness shall not project more than 12 ins. beyond the end support, unless fixed by nails or otherwise kept from tilting.

No mention is made in this rule of the traps formed by lapping boards. The limit of a 6in. and 12in. projection respectively will of course prevent the tilting of any board lying singly. Perhaps reliance is placed upon this to prevent danger arising from lapped boards, and it could justifiably be counted upon to do so if it were certain that the ends of lapping boards were always within 6in. or 12in., either over or short of a support. But it must not be forgotten that, say, 1½in. boards when lapped, however much they exceed the 6in. projection, will not tilt if the top board reaches within 6ins. of the support carrying the bottom board. If laid in this way it may be considered that they are "kept from tilting." Anyone with a practical knowledge of scaffolding, however, must know that boards do not always keep where first placed, and if, by any chance, the projection of the top board is lessened sufficiently, a trap is at once formed. This rule would have been more conclusive if it had been arranged that any single or butted board should not have more than a 6in. or 12in. projection, according to its thickness, and that all lapping boards should have a proper support under the lap.

6. All gangways used by workmen to carry materials thereon shall be at least 27 ins. wide when any part is more than 5 ft. from the ground or floor. The planks forming a gangway shall be so fixed and supported as will prevent undue and unequal sagging. When the slope renders additional foothold necessary, proper stepping laths, the full width of the gangway, at suitable intervals but not exceeding 2 ft., shall be provided.

This suggestion is a necessary one and deserves support. The word "carry" seems to give a restricted sense to the intention of the rule as it might not cover the use of a wheelbarrow. Other than this point, which really only involves a fresh choice of words, the regulation is excellent.

7. Single plank runs shall not be used, except within 5 ft. of the ground, landing, or covered floor. Runs between 5 ft. and 12 ft. in height shall not be less than 18 ins. wide, and those over 12 ft. in height shall not be less than 27 ins. wide, and shall be so fastened or supported as to prevent undue and unequal sagging.

The foregoing remarks in commendation of rule 6 are equally applicable here.

8. Loose bricks, drain pipes, chimney pots, or other unsuitable material shall not be used in the formation of, or for raising the levels of scaffolds, runs, or gangways.

The use of unsuitable material, as here suggested, is more often seen on small buildings than on large ones. Without wishing to offer carping criticism of an excellent rule, more especially of the drafting (which can be altered), we would say that the word "loose" seems entirely superfluous.

9. Scaffolding, gangways, or runs shall not be used for working upon until the construction of that part is completed and the safeguards required by these regulations properly fixed.

This regulation seems somewhat out of place. One would expect to find it either at the begin-

ning or the end of the series; unless, of course, it applies only to those previously mentioned or to follow, which is hardly possible.

10. Where a scaffold has not been erected by or under the superintendence of the employer whose workmen are to use it, the said employer, before allowing work to proceed thereon, shall satisfy himself either personally or by his agent that the scaffolding is in a stable condition, and that the materials used in its construction are sound, and that the required safeguards are in position, and he shall be responsible for the same so long as his workmen continue to use it.

As pointed out in an appendix, this is a regulation founded on a clause often seen in building contracts. No trouble should arise between the contractors and sub-contractors as to its fulfilment. In the building contract clause it is stated that the sub-contractors' workmen should have the use of existing scaffolding only. Reading this regulation and the clause together, it would appear that the employer, if contractor, would supply and fix all that was necessary for his own workmen, including the requirements of these regulations. If a subcontractor also at the same time used the scaffold, and for whom the scaffolding was equally useful, he would act as an inspector of scaffolding, so far as these requirements are concerned, and if the regulations were not kept he would have no option but to either supply the deficiency or withdraw his workmen. In the event of these regulations becoming enforceable, it it likely that a clause in building contracts will be necessary clearly defining the sub-contractor's position in case of any regulation being broken. Should the sub-contractor succeed the contractor on the scaffold, it is apparent that if he is to have the use of existing scaffolding only he himself would be liable to make good any deficiency in these requirements.

11. Scaffolding in use shall be examined once a month by a competent person deputed by the employer responsible for the scaffolding, who shall make an entry in the prescribed register to the effect that he has examined the scaffolding and its fittings and connections, and found them in good order, and that any fault found has been rectified.

The examination of plant is a good rule and one generally carried out on all large jobs—if anything, more frequently than here mentioned. On page VII. of the report, paragraph 17, the committee state that they have endeavoured to ascertain the practice of the master-builders who are careful of the lives and limbs of their workmen, and to draft regulations which would bring the careless builders up to that level. To make all builders have a periodical examination of their scaffolding would be certainly an achievement, but that it should only be made monthly seems somewhat below the standard set by the first-rate firms. It is certain that in the matter of scaffolding connections a more frequent examination is necessary; our variable climate, with its effect on cord lashings, for instance, rendering a frequently recurring examination necessary.

12. Working places and approaches thereto shall be efficiently lighted.

This regulation is much needed; it cannot be improved upon.

13. Gangways, runs, and staircases shall be kept free from unnecessary obstructions.

This rule hardly seems to go far enough. In regard to gangways and runs, no objection can be made, but staircases have particular dangers of their own which require more consideration than here given. That a staircase should be kept free from unnecessary obstruction can only be required if and when a clear passage for the workmen is wanted. In this case it is apparent that a danger must exist apart from the question of convenience. Knowing the rough condition of a staircase before the general finishing on completion, it is safe to add that the danger is one of falls, a danger which is accentuated if there is an open well of any size. Now, it is impossible to say that staircases shall not be obstructed. Scaffolding has often to be fixed in them close to the walls. When this is necessary it follows that workmen have to pass on the outside of the structure, and if the staircase is around an open well a considerable danger arises from the possibility of serious falls, a danger which can only be removed by the provision of a temporary handrail or a covering to the well itself on each floor. Another regulation should have been drafted dealing with this risk if no addition to it could be made here.

14. Every working platform more than 12 ft. above the ground, gantry, or floor, shall be provided on the side away from the wall, and at each end, with :—

(*a*) continuous guard rails, not less than 3 ins. by $2\frac{1}{4}$ ins. of deal or of equivalent section and strength, fixed at a height of 3 ft. 6 ins. above the scaffold boards (except where continuous ledgers are fixed in advance at a height not exceeding 4 ft. 6 ins. above the platform, measured to the top of the ledgers); and

(*b*) continuous guard boards of sufficient height (but not less than 7 ins. above the platform) to prevent material falling from the scaffold;

except where access is required for workmen or material. If the scaffold is used as a gangway from one part of the building to another, guard rails between 3 ft. 6 ins. and 4 ft. high shall also be provided.

Several considerations arise in connection with this regulation. There is apparently no practical reason for the stipulated height of 12ft. On page X. of the report, where paragraph 36 deals with the matter, it is said that this height was arranged, after serious consideration, as a compromise between conflicting evidence given as to the necessary height. Different witnesses gave opinions on the matter, the heights mentioned by them varying from 8ft. to 60ft. The committee express the hope that the height fixed, namely, 12ft., will disarm opposition by its reasonableness. Some criticism might be made that the guard-rail can be of light scantling, owing to its propensity to snap if at all short-grained. This, however, is a matter that will work itself out. If the master-builder finds that such rails, by reason of their snapping, result in a loss to him, it will be only a question of time before poles are in regular use for this purpose. Indeed, it is probable that as poles (at any rate in the South) are the handiest for such purposes, very little use will be made of sawn timbers.

The wisdom of fixing guard boards is generally admitted; in fact they are more often seen fixed than the rails. It would have been better, perhaps, had extra height been arranged for behind stacks of material, as at these places the danger of material falling is obviously greater. In appendix 8 at the end of the report a similar regulation to this is suggested, but with a larger number of exceptions, which seem practical and reasonable. No mention is made of them by the committee, with the exception of one that allows the rail and board to be removed for access to the platform.

15. Poles used for scaffolding shall have the bark stripped off.

The advantage of this is two-fold. First, the poles will have a longer life, and this is an undoubted advantage if they have to be kept in one position for a considerable time; secondly (and this relates more particularly to the standards), the rope connections are not so likely to slip down with the ledgers.

16. Putlogs shall be securely fastened, and at least two-thirds of the original number supporting each platform or scaffold shall remain in position until the scaffolding is finally removed. This shall not apply to working platforms at 10 ft. or less from the ground or floor.

At first sight the need for this regulation is not apparent. It may be that the fixing is to prevent their falling after shock and vibration, or when fixed they are to be depended upon to hold the outer frame in position. If this latter is the case it will probably prove a broken reed. The correct method of holding the outer frame in place is by the use of poles tied to a fixed position, and no reliance should be placed upon the putlogs for this purpose. The most that can be expected for the fulfilment of this rule is that the usual practice will be followed, namely, that one end will be wedged into the wall. If it had been intended that the putlogs should act as struts to keep the standards from falling towards the building, or to stiffen them in an opposite direction to the ledgers, the rule should have stated that they were to be fixed at both ends.

17. Poles, planks, ropes, or other materials shall not be thrown from a scaffold, floor, window, or other opening over 20 ft. above the ground, but shall be properly lowered.

This is a suggestion that should be rigidly enforced.

18. The working platform of outside scaffolding nearest the eaves shall remain in position until the carpenters, slaters, tilers, plumbers and other workmen have completed their work on the roof, and a section of the scaffold shall be left at any part of the building at which plumbers have work to do, unless a scaffold is erected for their use.

This, from the builder's point of view, seems somewhat arbitrary, unless the last phrase of the rule "unless a scaffold is erected for their use" applies to all work done on a roof by the trades mentioned as well as to such parts of the building where plumbers have work to do. So far as work on a roof is concerned, if the required platform is in position while the work is in progress it matters not whether it is the first fixed platform or not. This difficulty is more likely to arise where part of the work is being carried out by sub-contractors. The intention of the committee could have been made clearer. The purpose of the regulation is of course to prevent falls from the roofs and to assist plumbers, who handle heavy material.

19. For work on the roof of a new building, or where there is extensive repair on a roof and there is no pole or other scaffolding, or parapet wall, there shall be constructed a jib or cantilever scaffold not more than 30 ins. below the eaves, with a platform at least 45 ins. in width with proper guard-rails and guard-boards.

For work on the slope of the roof, scaffolding shall be constructed with proper framed brackets or cripples suited to the slope of the roof and suspended from the ridge or rafters by scaffold cords or wire ropes. The working platform on these brackets to be of planks not less than 9 ins. by $1\frac{1}{2}$ ins. and not more than 12 ft. long. In addition, a sufficient quantity of duck ladders or crawling boards properly secured shall be provided; such boards shall be not less than 9 ins. by $1\frac{1}{4}$ ins., with stepping laths of $1\frac{1}{2}$ ins. by 1 in., securely fixed at convenient intervals. The bolts for securing the suspending ropes shall not be less than $\frac{5}{8}$ of an inch in diameter, with a wood-screw end for screwing into the timber and a proper eye for receiving the rope.

Scaffolds shall not be supported by cast-iron eave gutters.

In the first part of this regulation no account has been taken of the pitch of the roof or its height from the ground or other similar levels. To some extent the regulation embraces the preceding one, but it accentuates the idea that the last phrase of No. 18 is not intended to apply to the work on a roof, as previously mentioned. From another point of view, these two regulations are not in accordance. No. 18 definitely states that the scaffolding platform nearest the eaves shall be kept in position, with no limitation as to distance from the eaves, and No. 19 equally definitely states that the distance shall not exceed 30ins. Again, why is a jib or cantilever scaffold so specially mentioned? As a suggested improvement we give the following :—"Where work is being carried out on a roof of a dangerous height and slope, and where no parapet exists, there shall be constructed close under the eaves a platform not less than 45ins. in width, with proper guard-rails and guard-board." A limit as to height and slope could be arranged for if thought necessary, in place of the word "dangerous."

The second paragraph is more particularly necessary where the slope of the roof is considerable. The limitations as to measurements are in accordance with general practice.

Cantilever Scaffolds.

20. Cantilever or jib scaffolding shall be constructed of strong bearing timbers, or steel joists, securely fixed and anchored from the inside and of sufficient length to ensure stability, and shall also be properly braced and supported.

This regulation is general in its terms and should meet with approval.

Trestle Scaffolds.

21. Every working platform erected on trestles (except painters' trestles) shall, where the trestles are 5 ft. or more in height, be of a width of at least 5 ft. 3 ins., and where the trestles are of less height than 5 ft. shall be of a width equal to the height of such trestles. Trestle scaffolds of more than three tiers and ex-

ceeding 15 ft. above the ground or floor shall not be used. The boards forming working platforms for internal work for the use of plasterers and painters shall not be spaced more than 7 ins. apart.

This regulation is of more importance to Scottish builders than to those accustomed to the Southern system, although the last sentence will affect the trades mentioned.

22. When bedding or fixing door or window frames a floor or platform shall be provided to enable workmen to perform their task without danger to themselves or those below them.

Without some such arrangement as is here prescribed it is obvious that a carpenter runs considerable risk of falling. In the case of window frames the window sill offers most insecure footing, and it is only right tnat a platform should be fixed for safety.

Suspended Scaffolds.

23. On every suspended scaffold not exceeding 10 ft. in length, the platform shall be at least 18 ins. wide and of adequate thickness. Such scaffolds exceeding 10 ft. in length shall be of proportionate strength. There shall be at least two supporting fibre ropes of $\frac{3}{4}$-in. diameter, or wire ropes, or iron hangers of equivalent strength, for every two men on such scaffold, and continuous guard-rails shall be provided, securely fixed at a height of 3 ft. 6 ins., and also a continuous guard-board not less than 4 ins. above the platform.

Trestles or other means of increasing the height shall not be used on suspended scaffolds less than 30 ins. wide.

When a skip or large basket is used as a suspended scaffold for one man, it shall be not less than 2 ft. 6 ins. deep, and shall be carried by two strong iron bands properly fastened and continued round sides and bottom with eyes in the iron to receive the ropes.

Platforms resting on wooden bearers let into the wall at one end without other support shall not be used except such as go right through the wall, are securely fastened, and are of sufficient strength.

Figure or bracket scaffolds fixed by strong iron dogs or spikes driven into the wall shall not be used except for the purpose of pointing or cleaning down stone walls, or repairing chimney stacks, and shall be well made of strong materials, and, when of wood, strapped with iron at the angles. The working platforms shall not be less than four $6\frac{1}{2}$ in. by $2\frac{1}{2}$ in. planks wide, and shall be efficiently guarded. They shall not be fixed at a height less than 5 ft. from the eaves.

The dimensions here given all tend to safety. It is hoped that when consideration was given that two fibre ropes or other supports of equivalent strength were to be provided for each two men on the scaffold, all possible weight of material was taken into account. Trestles on suspended scaffolds are out of place, although in the American system of steel construction they are often seen. Another danger not here mentioned is that the trestles are sometimes seen on platforms not fully sheeted, single boards being laid to take the trestle legs. This must necessarily increase the danger.

Platforms resting on wooden bearers let into the wall without other support are here prohibited. This will affect the Scotch builders principally.

Figure or bracket scaffold fixed by iron dogs are not allowed within 5ft. of the eaves apparently, so that the weight of the wall will prevent the joints being started, with a consequent loosening of the dogs or spikes. Two members of the committee would prohibit these scaffolds entirely, on the ground that additional support should be given, either from above or below.

24. Planks supported by ladders, steps, or folding trestles, shall not be less than 9 ins. wide and $1\frac{1}{2}$ ins. thick, and shall not exceed 9 ft. bearing. Where steps are used, the platform shall not exceed 7 ft. in height.

A useful addition to this rule would have been that no boards should be laid on the top of any steps, but only below, where the sides would prevent their slipping entirely off. The limitations as to measurements are useful.

Ladders.

25. Ladders used as a means of communication in, on, or about a building under construction or repair shall rise at least 6 ft. above the place to which they give access, shall not be raised on bricks or other loose packing, but shall have a level and firm footing, and shall be securely fixed so that they cannot move from their top point of rest, and if of more than 40 rungs shall be stayed in the centre of length. Ladders which cannot be secured at the top, shall, if over 25 ft. in length, have a man stationed at the foot to prevent slipping, or shall be securely fastened at the base. A ladder having missing or defective rungs shall not be used.

Ladders made from sawn timber shall not be used unless of adequate strength and the steps securely notched-in or housed.

This regulation is entirely good. It is very seldom that a ladder cannot be fixed at its top point of rest by some means, but recognition is taken of the fact that such a possibility may occur. It is taken for granted that "ladders of sawn timber" means those made by the carpenters out of scantling sawn on all sides.

Floors.

26. Openings left in the floors of buildings or working platforms for elevator shafts, stairways, or for the hoisting of material, or for access by workmen, or other purposes, shall be securely fenced by guard-rails 3 ft. 6 ins. in height, and by guard-boards at least 7 ins. high, or be completely covered with planking.

The necessity for this regulation must be generally admitted; the committee, however, seem to have overlooked one or two points. No exceptions have been made to allow for the access of workmen or material. Such an exception is allowed in regulation 14, which in a similar manner provides safety to those using working platforms, and the same exception, it is thought, would be equally necessary here.

27. Each floor of the building below which workmen work or pass shall be covered in such a manner as to be an efficient protection to the men beneath.

The danger to workmen from the dropping of material, tools, etc., is well known, but this regulation seems to embrace too much. The danger to the workmen beneath a floor is not due to the fact that they are in that position. The danger only arises when work is going on overhead. The regulation should have added to it after the word "pass" the words "and above which work is in progress."

Cranes.

28. The stage for every crane shall be built of sound material, shall be of good mechanical construction having regard to its height and the lifting and reaching capacity of the crane. It shall be securely anchored to a solid foundation. The platforms for the driver and the signal man shall be of sufficient area, close-planked, securely fenced, and provided with safe means of access.

In reading this rule some doubt arises as to whether the stage or the crane is to be anchored to a solid foundation. Is it to be considered that the stage of a Scotch derrick is anchored down by the masses of brickwork built up in the lowest bay of the queen legs and sometimes also in the king; or would it not be more correct to consider the crane as being anchored thereto by the chain which holds down the guys and sleepers?

The provision of safe means of access to the platforms is good; the difficulty of climbing up a queen leg where the ladders are in short lengths, with a minimum size in landing stages between each, is well known to those experienced.

29. The working gear of cranes, crabs, and all hoisting apparatus and of anchoring appliances, and all bolts and cotters, shall be easy of access for inspection: the working gear shall be kept in good repair and working order and shall be cleaned and examined at least once every week.

The ropes or chains shall be securely fastened to the barrels.

30. Every crane shall be provided with proper brake power and shall have the safe load plainly marked upon it. No crane or gear shall be loaded beyond the safe load. No load shall be left suspended from a crane unless there is a competent person actually in charge whilst the load is so suspended. The lever controlling the link motion reversing gear shall be provided with a suitable spring locking arrangement.

Every type of hoisting machine, tackle, or apparatus, and the appliances connected therewith, shall be of good mechanical construction, sound material, and of adequate substance, and shall be properly and securely fixed and of suitable strength.

The committee have in these regulations found themselves on surer ground. Doubtless they have had all the wider experience of the factory inspectors to draw upon, with the result that these rules are clear, concise, and to the point.

31. Chains used for hoisting purposes shall have been tested, shall be annealed once a year, and shall be examined by a competent person every three months. The safe-load indicated by the test, and the date of last annealing, shall be entered in the prescribed register kept on the premises.

The testing of chains is apparently not to be periodically carried out. Reliance for safe working is to be placed upon the yearly annealing and the quarterly examination. Some difficulty will probably arise in keeping the register on the premises. On small works where there is no office, the foreman's pocket is, it is supposed, to do duty in this connection. Further consideration should have shown the committee that if the register had been kept by the builder in an accessible place where it would have been open to inspection as and when wanted, all requirements would have been met.

32. Crane drivers shall be properly qualified men. No person under 17 years of age shall be employed to give signals to a crane driver.

This regulation is an attempt to set up a standard of qualification which is necessary.

33. Signals for hoisting shall be such as can be readily heard or seen, and shall be distinctive in their meaning to the person who has to act upon them. Where a sound signal is used, the signal shall be made by an efficient gong, whistle, or electrical apparatus. The signal wires shall be protected from accidental interference.

Signalling by sound is a comparatively new method of conveying instructions to crane drivers. It has become necessary owing to the method now seen on buildings erected of steel of placing the crane engines on the lower floors of the building, often in the basement. This means that the driver is out of sight and the method of signalling by sound is the easiest means of communication. Accidental interference with the wires or cords connected with the gong, etc., should be avoided, as false signals may thus be given. For this purpose the wires should be protected.

34. Boxes used for hoisting bricks or other loose material shall be closed-in on the four sides.

This rule will affect the brick crates which are usually enclosed at the ends only.

35. Proper safety or spring hooks only shall be used when hoisting barrows, or buckets, or baskets; the latter shall be of a type not depending entirely on the handles for support.

Safety hooks are necessary when it is remembered that barrows, etc., are not handled in the most careful manner during hoisting. Baskets specially made so that the wicker handles do not take the entire weight can now be bought, and no difficulty should arise in their provision. Compliance with this rule will not mean that any considerable amount of plant will be wasted, because in ordinary circumstances baskets have a very short life.

36. Rails on which travelling cranes are run shall be of uniform section, shall be secured by fishplates, and shall rest on sleepers.

No objection can be made to this rule.

Machinery.

37. The fly-wheel of every engine, all dangerous parts of the machinery, every part of the mill-gearing, and electrical conductors and switches shall be securely fenced, or be in such position or of such construction as to be equally safe to every person employed as they would be if they were securely fenced. Water gauge glasses on steam boilers shall be adequately protected by a guard.

Again it is seen that the committee, in dealing with machinery, have found themselves on sure ground.

Excavations.

38. In all excavations, except in rock, necessary timber struts, waling planks, and boards shall be provided and used; and in works of underpinning, the adjacent walls and ground shall be properly shored and strutted.

Most books dealing with excavations give tables showing when strutting, etc., is necessary. It is a pity that a table taken from a standard work could not have been given as a guide. The work of underpinning is different; so much depends upon circumstances that the builder's judgment must be relied upon.

Lead Poisoning.

39. Washing conveniences shall be provided for the use of painters and plumbers, with a sufficient supply of water, soap, nail brushes and towels, and at least one bucket or basin for every five persons.

40. Painters or plumbers shall not take their meals, or deposit clothing put off during working hours, in the paint-mixing room or the plumbers' shop.

41. Rubbing down or scraping of painted surfaces containing lead, shall, where practicable, be done by a moist method.

These rules, combined with those numbered 45 and 46, are an endeavour to prevent lead poisoning among plumbers and painters. In appendix 9 it is stated that the causes of poisoning appear to be (1) dust caused in sandpapering one surface of paint before applying a fresh coat; (2) dust from mixing dry white lead with oil; (3) dust arising from paint that has dried on the overalls; (4) fumes from burning off old paint; (5) absorption of lead by the mouth from unwashed hands.

Nos. 1, 3, 4, and 5 are perhaps the most likely causes to affect painters and plumbers in ordinary. Water, soap, brushes and towels are to be provided by the employer and, what is equally necessary, the workmen are to be compelled to use them.

Paint mixing rooms and plumbers' shops it must be admitted by anyone accustomed to such places are not fit places for use as meal rooms, although they may be particularly tempting on a cold winter's day where a proper mess room is not provided.

PART II.
DUTIES OF WORKMEN.

During the construction, alteration, or repair of any building, the workmen who use any gangways, working platforms, scaffolds, trestles, gabbards, ladders, cranes, machinery, or other appliances, shall observe Part II. of these regulations.

This paragraph seems needlessly elaborate. "All workmen engaged on the building" would be simpler.

42. They shall co-operate with the employers in carrying out Part I. of these regulations, and shall report to the employer or foreman any defect they may discover in the plant or appliances.

This is a regulation that should work to the advantage of both employer and workman. It is to be feared that, in present circumstances, a workman would as a rule be somewhat chary of at any rate repeatedly bringing to the notice of a builder the fact that a defect existed. If this rule becomes authorised, and the employer shows his willingness to consider reports made to him, it should tend to minimise or entirely remove many existing dangers.

43. They shall not interfere with, take away, or destroy any of the plant, appliances, or safeguards required by these regulations, without the authority of the employer or his responsible foreman.

This is an important regulation and should put a stop to an abuse that has long existed. The removal of any safeguard especially is excellent. An improvement, however, might be made if the words " or which endangers the stability, strength or safety of any part of the works" were added after the word "regulations."

44. They shall not be carried by the cranes, or ride in barrow hoists, or hod hoists, or adopt other unsafe means of getting about the building, but shall use the gangways, ladders, or staircases provided for the purpose.

This regulation protects the workman against himself. Sheer foolhardiness is the reason for many of his actions, and he should learn the lesson that, whatever his nerve, skill, or athletic prowess may be, a building in course of construction is not the place for their exhibition; for it cannot be contended that these regulations cover all the dangerous conditions that may arise, and against which the employer may offer protection.

Lead Workers.

45. Painters and plumbers shall carefully clean and wash their hands before leaving the premises or partaking of food, and shall not partake of food in the paint-mixing shop or plumbers' workshop.

46. Suitable overalls shall be worn by plumbers and all persons employed at mixing or using paints or other material containing lead or lead compounds, and shall be washed once a week. The overalls shall not be worn at meals.

CARRYING A CHIMNEY-BREAST

By Alan E. Fletcher, M.S.E.

Cutting away a wall carrying a chimney-breast is a very frequent necessity in alteration jobs, but the design of the brackets to carry the projecting brickwork of the breast is (to judge by some of the rather impracticable details occasionally seen on architects' drawings) a matter of some uncertainty with some members of the profession. As a rule, these little slips are licked into shape by the steelwork firm supplying the girders, but it is thought that a few brief notes on some of the usual ways of making such brackets may be useful at some time or other to those who have not had occasion to consider the matter before, and who like to see their own details worked to.

The design to be adopted will depend upon the extent of the breast and the weight to be carried, and also upon the condition of the brickwork.

In good work the natural corbelling formed in the bonding of the brickwork might be assumed to carry the weight from a few courses above the point where the support is withdrawn, but, although this assumption is very often made in these cases, it is safer not to trust to such a condition of things, as cracks in brickwork are particularly probable owing to the variations of temperature in the flues.

Another point is that the projection of the chimney-breast, and consequently of the brackets carrying it, is usually short, not often exceeding 2 ft., and the weight of the steel to carry even a heavy load on such a short projection is not a great consideration; so that there would seem to be no reason for the strength of the bracket to be, as it often is, a compromise between the theoretical maximum and the architect's judgment of the probable practical necessities of the case.

Where the projection is small and the weight light, the form shown in Fig. 1, will be found suitable and inexpensive. Small ½in. or ⅝in. plates are bolted to the top of the joists, and the oversailing portion carried by short forged brackets of angle steel bolted to the web of the front joist, with holes to bolt to the joist and also to the bracket after fixing the joist. As a ¾ in. rivet cannot properly be got in a smaller section than 3 in. by 3 in. angle, this settles the size of the brackets. Where the supporting girder is formed of separate joists without plates, *i.e.*, not a compound girder, it is as well to put in cast-iron separators between them, arranged so as not to come in the way of the bolts or rivets securing the brackets.

A heavier form of bracket, shown in Fig. 2, has a top member added, and is suitable for chimney-breasts with a larger projection. The strength of this top

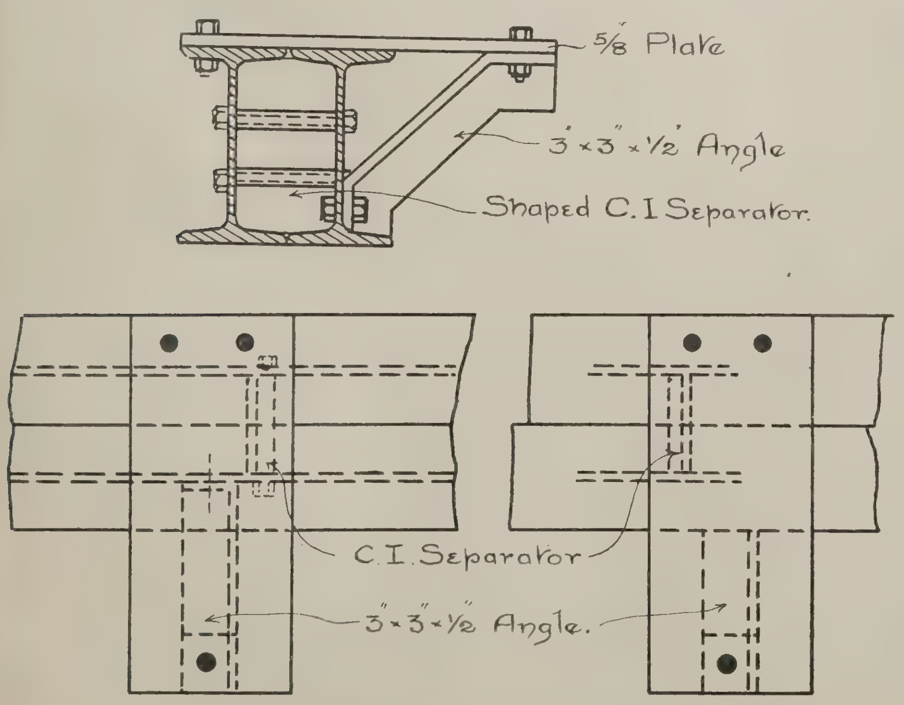


FIG. 1.—BRACKET FOR CHIMNEY BREAST.

member should be calculated as a beam under distributed load, and also as a tension member, the like stresses of the two results being added, in order to make sure that the maximum safe load per sq. in., is not exceeded. For most cases it will be found that when a section of sufficient size to hold the rivets is put in, it will be strong enough in other respects. Although the plate is sometimes riveted to the top angle of the bracket, it is usual to neglect the effect of this in resisting the stresses.

A frequent case is where two chimney-breasts are found back to back, and a cheap and efficient way of carrying them is as shown in Fig. 3, where joists of small section are bolted to the main girder at frequent intervals—say, 1 ft. apart. This method requires some careful measurement when inserting the needles, so that they shall not come in the way of the small joists. It is possible to use the joists themselves as needles, but owing to the trouble of cutting them in position and drilling the girder for them, it is not usually worth the trouble. To carry the brickwork between the small joists, short pieces of flat bar, such as most builders have by them, are suitable. The weight of the breast each side is calculated and divided over the number of joists used, these latter being cantilevers in effect.

It will be found usually that a very small size will be sufficient, but care must be taken to see that the section is strong enough to take the shear developed, because this is greater than that developed when the beam is under the conditions upon which the tables of strength of joists are usually calculated. The bolts will take up slight inequalities in the weights if the chimney-breasts each side balance one another approximately, but if there is any considerable difference the joists under the heavier side will have to be reinforced by struts to the bottom flange of the girder.

Fig. 4 is an example of heavy bracketing such as might be required for picking up a heavy chimney-breast extending up several storeys. The brackets are formed of ½in. steel gusset-plates, with angles riveted each side and forged to fit to the joist-web and flanges. The brackets are calculated as cantilevers of varying depth, attention being given to their shearing strength. They can be fixed by bolts passing through both webs of the girder, if a compound, or can be riveted to the web before the girder is made up, the latter being the better plan, but awkward for purposes of transit.

The principal points to note when designing such brackets are, that the strut of the bracket is to have a well-fitted bearing on the root of the lower flange of the girder or joists, and that the shearing strains (which are often safely neglected in selecting joists when used as beams) must be carefully provided for in such short cantilevers as shown in Figs. 3 and 4.

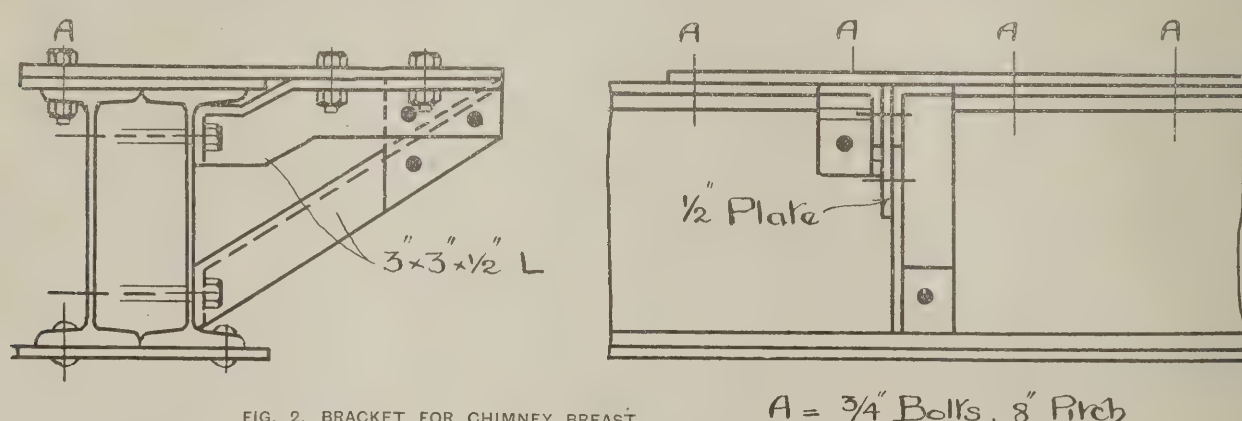


FIG. 2. BRACKET FOR CHIMNEY BREAST.

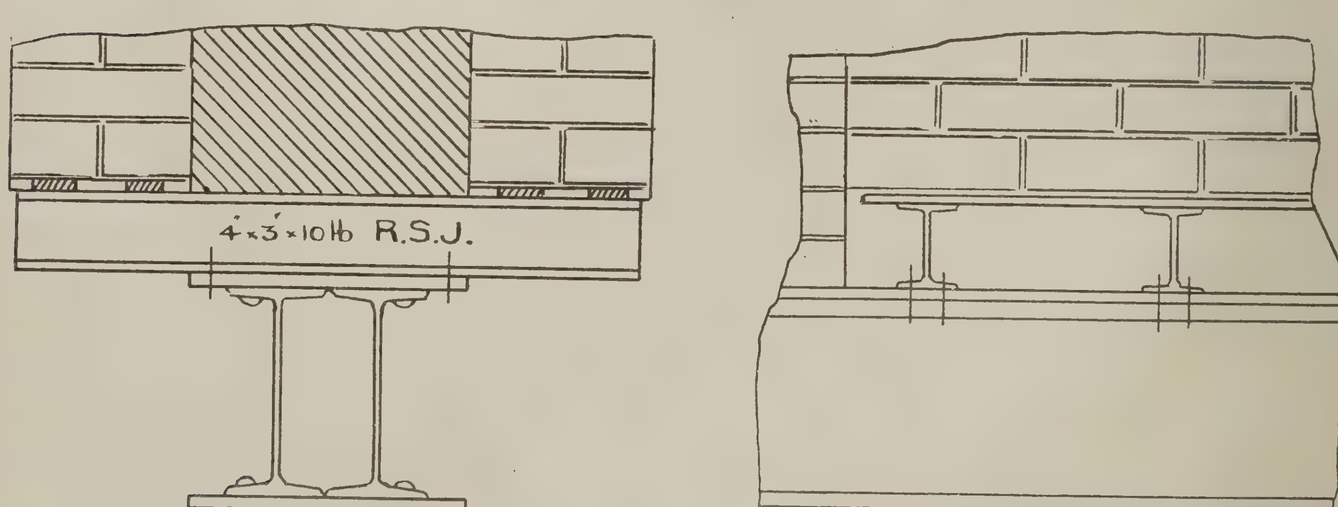


FIG. 3. DOUBLE CHIMNEY BREASTS.

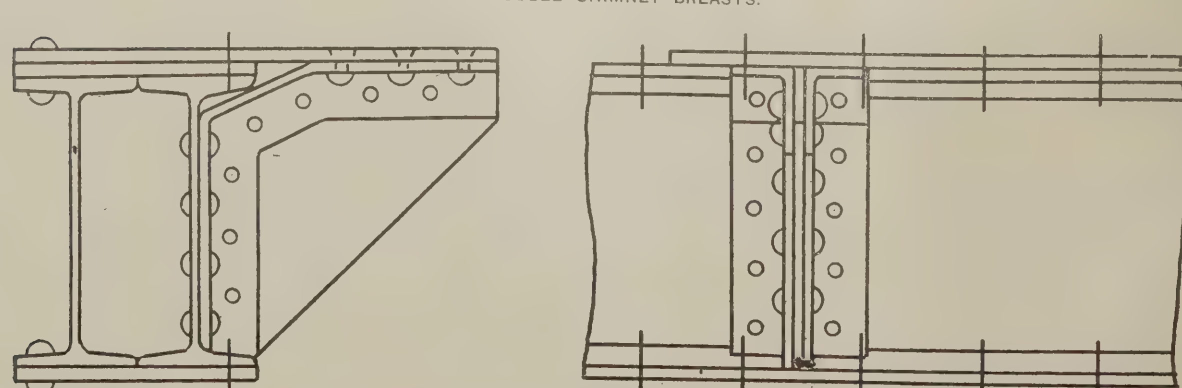
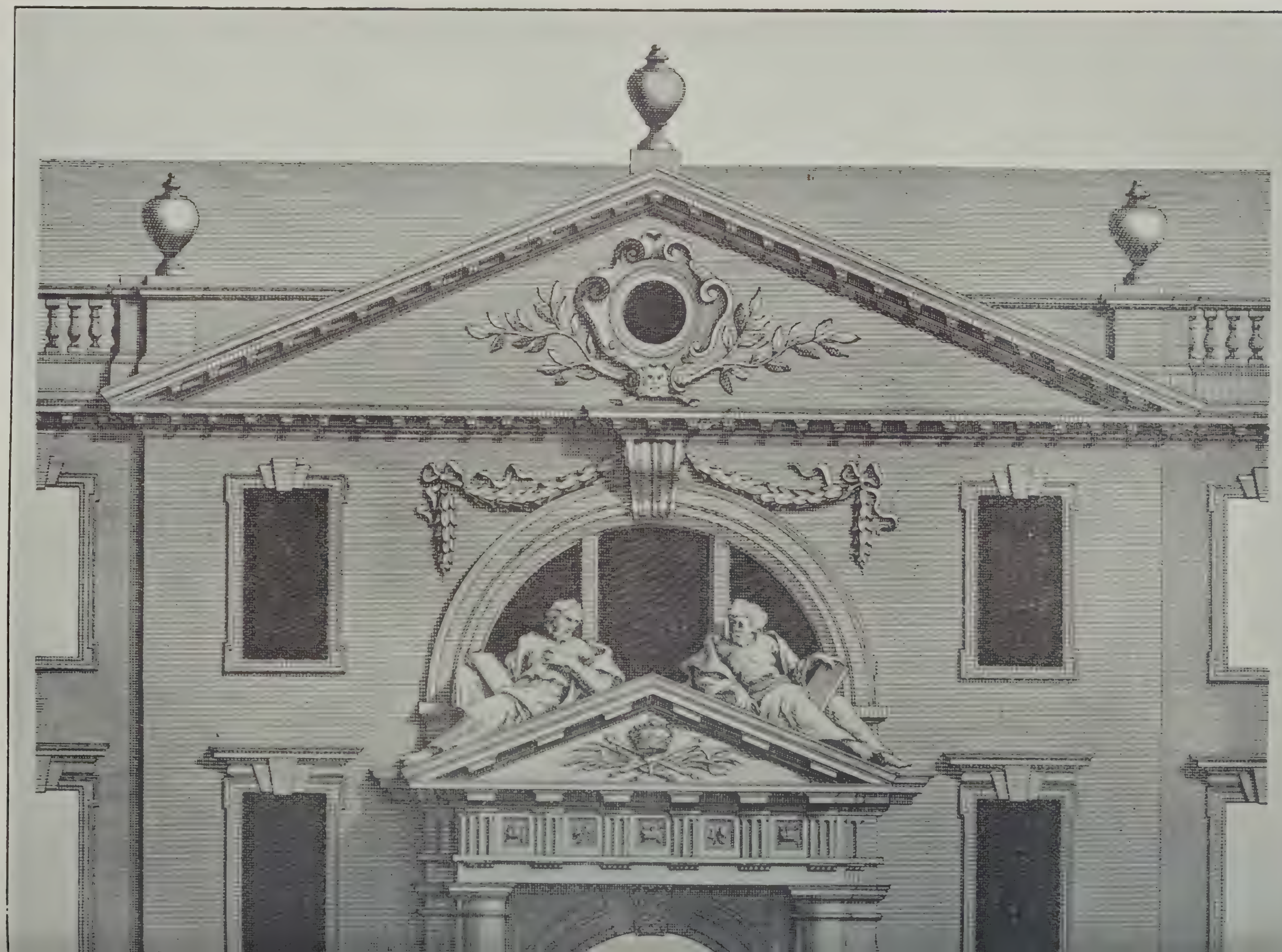
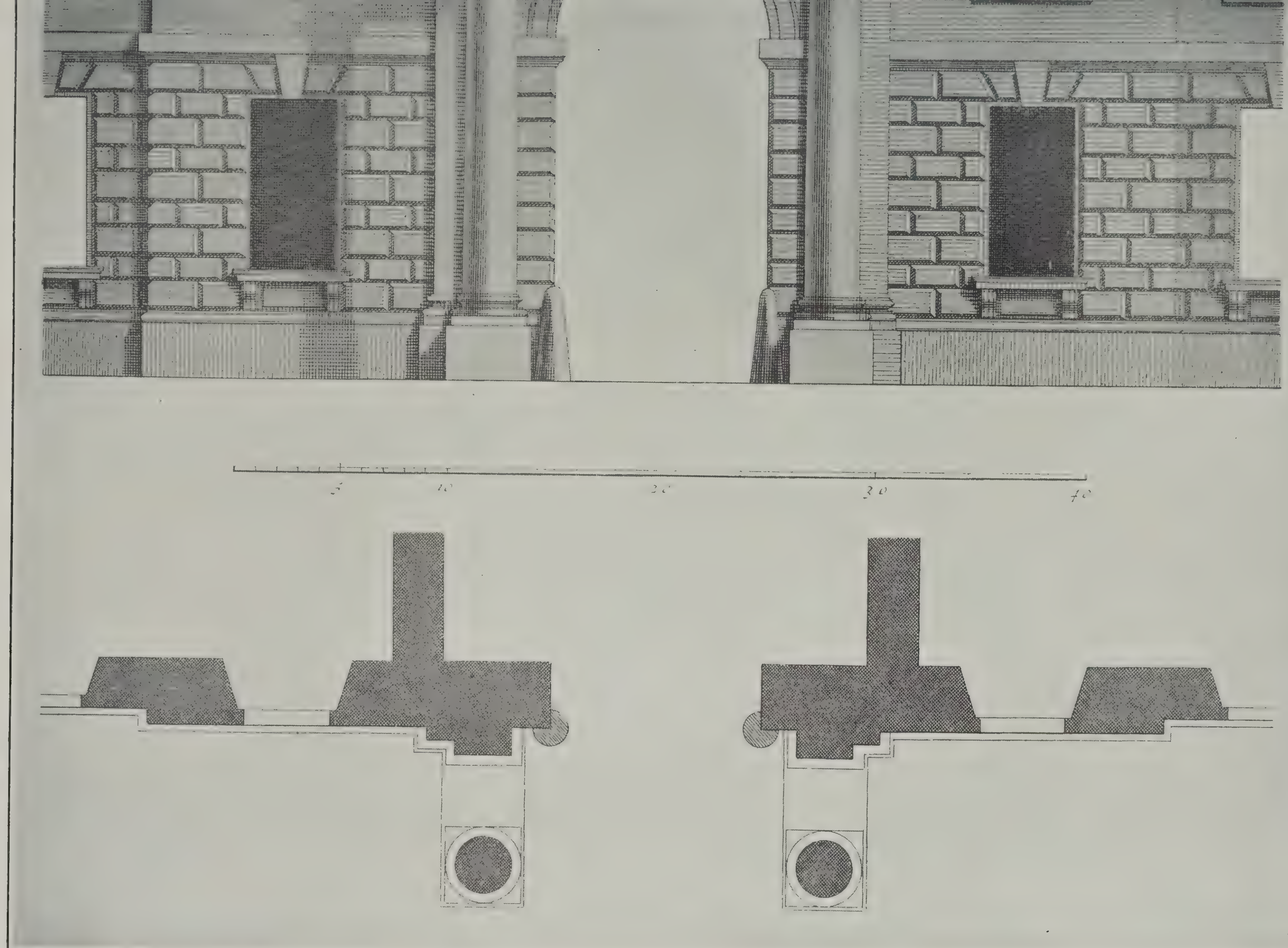


FIG. 4. BRACKET FOR CHIMNEY BREAST.





THE FELLOWS' BUILDING, KING'S COLLEGE, CAMBRIDGE: CENTRE PORTION OF WEST FRONT. JAMES GIBBS, ARCHITECT.

January 15, 1908. Volume 27, No. 675.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER

Notices.

Offices : 6, Great New Street, Fetter Lane, London E.C.

Telegraphic Address : "Buildable, London."

Telephone : 2200 Holborn (6 lines).

Date of Publication : The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is publisheed every Wednesday, price 2d.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

NOTICE.—On and after Monday next, January 20th, our editorial and advertisement offices will be changed from 6, Great New Street to Caxton House, Westminster (at the back of the old Aquarium site). The publishing offices, however, will remain at 6, Great New Street, E.C.

The Dispute about Winchester Cathedral

A dispute has been going on in the columns of the "Times" about the work of repair and underpinning at Winchester Cathedral. The discussion has arisen out of a report made by Mr. William Weir, Mr. Walter K. Shirley and Mr. Thackeray Turner on behalf of the Society for the Protection of Ancient Buildings. This small committee appears to have gone down to Winchester for the day and made a cursory examination of the work in progress, and their report is not only strongly biassed, but inaccurate in several important particulars. They have also put forward the ridiculous statement that a good mortar can be made with a proportion as low as one part of cement to eight of sand. It will be recollected that some time ago serious subsidences were found to be taking place in the exterior walls of the retro-choir and lady chapel of Winchester Cathedral, and as these proved to be very serious the authorities requested Mr. T. G. Jackson (the diocesan architect), Mr. J. B. Colson (architectural surveyor to the cathedral) and Mr. Francis Fox to draw up a report and to suggest means for remedying the trouble. The experts in question decided that it would be necessary to excavate down to a gravel bed 16 ft. below the old foundations, and to underpin the fabric. This difficult task has been in progress for about two years, and much still remains to be done. It is not, however, so much in connection with this part of the work as in regard to the treatment of the actual stonework that Mr. Thackeray Turner and his Society have been busying themselves. In particular, they have said that the surface of the old stonework was being "dragged," that a great deal of new stone was being inserted, and that the jointing was being done in a most unsightly manner: all of which statements are refuted. It was further alleged that Mr. Jackson had raised the vaulting 2 ft., necessitating disturbance of the old work; but, as Mr. Jackson points out, the vaulting ribs had sunk to this extent from their original position, and the wonder is that the whole of it had not utterly collapsed. At a time when the cathedral authorities are so badly in want of funds that half of the workmen engaged in the underpinning have had to be discharged, it is especially unfair for such an unwarrantable report to be circulated, and, though so much evil has been wrought under the title of "restoration," we feel sure that all fair-minded architects will share the strong views which have been expressed by Mr. Jackson and Mr. Francis Fox in regard to the report in question. We have not space to print the correspondence in full, which will be found in the columns of the "Times," but we think it of interest that our readers should know that the Society for the Protection of Ancient Buildings has in this case made quite an unsubstantiated charge—one which will do them much harm.

Regulations for Secondary Schools.

Under the newer schemes of education in vogue, secondary schools are taking an increasingly important place, and we have only to recall the many competitions for such buildings that have been held during the past year or so to emphasise this fact. Architects therefore will be glad to know that the Board of Education has just issued a series of building regulations for such schools. This report we do not print because it would fill many columns, and the original can be obtained, price 2d. only, from Messrs. Wyman and Sons, Ltd., 109, Fetter Lane, E.C. All architects engaged in school work should get it at once.

The Ironmongers' Almshouses.

At the public enquiry held last Thursday in the Ironmongers' Hall with regard to the application of the Ironmongers' Company for permission to sell the historic almshouses in Kingsland Road, Mr. E. L. Lutyens, F.R.I.B.A., stated that the almshouses were valuable specimens of 18th century architecture and their destruction would be a very serious loss to London. Then followed Mr. George Hubbard, F.R.I.B.A., who spoke of the defective condition of the buildings, and said it would be a very expensive matter to remedy the defects. Mr. F. W. Troup, F.R.I.B.A., however found the buildings to be in a good structural state, and expressed the opinion that what defects existed could be remedied without much trouble. These conflicting reports testify to the everlasting quality of the expert witness.

The Value of Proportion in Architecture.

It is refreshing in these days of unbridled architectural licence, thinly veiled sneers at scholarship, and the apotheosis of the untrained genius, to find a practising architect seriously putting forth a plea and one moreover that is extremely convincing, in favour of the supreme value of Proportion in relation to the art of architecture. We allude to the presidential address recently delivered by Mr. J. L. Ball to the members of the Birmingham Architectural Association—a masterly exposition. Commencing with the, very possibly, correct assumption that the definition of architec-

ture as "a Mathematicated Art operating solely by the medium of Proportion " will come to many as "a chilling surprise," and anticipating questions of the following nature, "Is there no room in this Art for the play of the finer qualities of Imagination and Emotion?" "Is architecture really only a matter of Proportion, of Ratios, of Equations?' Surely there is a mistake here. Either architecture is something more than Proportion, or it is not an art at all, or at best a mere mechanical Art"—anticipating all these questions, Mr. Ball says that those who reason thus have failed to perceive the necessary limits of his subjects, from which, for the sake of clearness, he has excluded all metaphysics, every reference to the powers of the individual mind. He deos not deny that all great work in architecture has been done by men of extraordinary intellectual and imaginative powers, but he asserts that the method by which these powers have operated—the medium, so to speak, in which they have been displayed—has been no other than Proportion. To the further objection that may be advanced against the theory, namely, that Proportion, regarded as the sole method of architecture is altogether inadequate to account for the prodigious results attained in this art, Mr. Ball insists that it is an objection which would apply with equal force to *any* of the arts, all of which achieve extraordinary results by simple and ordinary processes, and that the contrast between methods and results is the perennial miracle of Art. For instance, the cutting and manipulation of stone and marble is no very difficult or recondite process, yet Polycleitus and Praxiteles needed no other to represent the symbolic effigies of the gods. Language, again, is an elementary acquirement, yet it is by this medium that poets express *all* the passions and emotions of the soul. Taking the case of one of the most primitive of architectural conceptions —the Egyptian pyramid—we perceive that the impression it conveys can be assigned to nothing else than to Proportion. To those who support the popular impression that architecture is not an independent art at all but merely an unpremeditated result, a something unconsciously, or accidently, produced by fine building, and that it is altogether indefinite, and indefinable, and arises from the nature of the material, from the necessities of convenience, or of structure, custom, or usage; that Proportion is nothing but a convention, a name for what we are accustomed to see, Mr. Ball replies that at least as regards what has actually happened in the past such a statement is grotesque and incredible. The entire history of architecture contradicts it. What evidence is there, he asks, in the thirty centuries of historic building that architecture has been only an accidental product of utility, of material, of the necessities of structure? As applied to the greater works of architecture, not only is there no evidence to support it, but all the evidence we have points the other way. Mr. Ball's dissertations on Greek temples, on Gothic architecture, from the twelfth to the fifteenth centuries, in which he analyses their Proportions, are exhaustive, and offer a considerable amount of food for reflection; but we are unable to do more than to indicate, in general terms, the trend of thought apparent in an erudite, thoughtful and altogether delightful presidential address.

THE ASSESSING OF COMPETITIONS.

The Jury System or a Court of Appeal?

Is it not desirable, in the interests both of architects and their employers, to settle some definite course of action with regard to the future conduct of architectural competitions?

We imagine that very few architects will venture to challenge the statement that the system, hitherto very generally followed, of appointing a single assessor, whose judgment competitors are expected to regard as final and without appeal, is radically wrong in theory and often disastrous in its effect upon the art of architecture.

In what other profession are its members expected to cheerfully and uncomplainingly forego their inherent constitutional right of appeal against what is generally admitted to be an act of injustice?

How many architects really and conscientiously feel that they are able to place implicit confidence, in the broadest possible sense of the term, in the soundness of the judgment of any *single* member of their profession?

We admit that some men are excellent judges of scholarly architectural designs (though, unfortunately, there are few assessors of this type), whilst they may be utterly lacking in practical knowledge of the administrative or other requirements of the class of building designs for which they are engaged to assess. Other assessors may be well conversant with these working requirements, and yet have a very indifferent appreciation of the "art" they are supposed to follow.

Then, again, there are the idiosyncrasies of various assessors to be considered. We have heard it stated that one well-known and experienced assessor maintains that it is the assessor's duty to select the best *man* among the competitors! an idea which, amusing as it is, from its very *naïveté*, is not likely to be greatly appreciated by those architects who have expended a considerable amount of time and money upon the preparation of their competitive *designs*.

We are also told of an assessor, obviously of another school of thought, who asserts that he never experiences any difficulty in arriving at a satisfactory result. His method, we are assured, is simplicity itself, consisting as we understand it in the selection of the six best *elevations* and then determining which of the six is accompanied by the most satisfactory *plan*!

An assessor of another type, whose logic we confess we are unable to follow, will maintain that it is his duty to select the design that is the best suited to "the particular object the promoters of the competition have in view," and not necessarily the one that has best complied with the regulations and conditions which have governed the preparation of the designs of a large majority of the competitors.

Our confidence in the jury system of assessing designs was considerably shaken by the deplorable result of the recent competition for the Palace of Peace at the Hague. Here we had a jury composed, presumably, of experienced and capable architects, whose personal characters and aims were, we are convinced, altogether beyond reproach. The result, as our readers know, was the selection of a design of a grotesque nondescript "style" of architecture which, possibly, might have passed muster twenty or thirty years ago, but to-day creates a feeling of utter repugnance in the mind of any well-trained or scholarly architect.

With regard to the latest application of the jury system, that of the competition for the London County Hall, either as the result of a too pertinacious policy of "officialdom" or by the advent of that "red-tapeism" which is apparently inseparable from all important competitions in this country, the project has been so miserably mismanaged, from its very inception, that we are unable to look forward with any degree of confidence to a satisfactory result. We are, however, very curious to know by what subtle arguments the promoters of this competition were convinced that whilst it was necessary to retain the services of three assessors to report upon the twenty or thirty designs that were to be submitted in the final stage of the competition, yet in the case of the preliminary competition, in which it might very reasonably be expected that from 100 to 300 designs would be received (91 was the actual number) only two assessors were required!

On the assumption, and judging from the failure of the Peace Palace Competition—it is not an unfair one—that the jury system has already been tried and found wanting, will the undoubted grievances from which competing architects have suffered for so many years be likely to be righted by the institution of a Court of Appeal, composed of a small body of architects, who would be empowered to review all the awards made in architectural competitions with regard to which there would appear to be *primâ facie* evidence of good cause for complaint?

After all, the main object of every architectural competition is, or should be, to secure the best possible result. But, to attain this, competing architects need to be encouraged to put forth their best efforts by the certain knowledge that their work will be adjudged in the fairest, ablest, and most conscientious manner possible. Can it be alleged that they invariably receive treatment of this kind under the conditions at present governing the conduct of architectural competition?

THE STRAND ENTRANCE TO SOMERSET HOUSE.

William Chambers was by birth a Swede, having been born at Stockholm in the year 1726, but at an early age he was sent to England to be educated. Shortly after leaving school he appears to have travelled in the capacity of supercargo to the East Indies and other parts of the world, and among other places he is known to have visited Canton, where, as he had developed a considerable taste for drawing, he made sketches of the buildings and costumes of the Chinese, a selection from which he subsequently published.

After a comparatively short experience of commercial pursuits, Chambers abandoned them, and following the natural bent of his genius, travelled in Italy, where he soon became known as an indefatigable student of architecture and of its cognate arts. The works of such men as Michael Angelo, Sangallo, Palladio, Scamozzi, Vignola, and other Italian architects, are said to have been examined and studied with unwearied application by Chambers. He is afterwards heard of in Paris, where he became, in due course, a pupil of Clerisseau, and formed the acquaintance of Reynolds, Wilton and other English artists of note. When one remembers the almost ultra-refined nature of some of his architectural detail, it is difficult to realise that Chambers never visited Greece, and that his considerable knowledge of Hellenic art was mainly acquired through his exhaustive studies of the invaluable remains of the earlier Roman antiquities, and by careful research into the *causes* which produced the artistic *effects* he so much admired.

It is also interesting to observe that Chambers owed much of his success in his profession to the kindly feeling and goodwill of a brother architect—John Carr, of York, who, on being asked by the Earl of Bute to recommend an artist to instruct the youthful Prince (afterwards George III.) in the study of architecture, "told his Lordship that he knew a young man, named Chambers, who would exactly answer his purpose." Lord Bute accordingly introduced Chambers to the Prince, who, on succeeding to the throne, appointed him his chief architect, and afforded him numerous opportunities for the free exercise of his talent and skill in architecture.

Amongst other works Chambers was employed to lay out the grounds and to design a number of garden pavilions at the residence of the Princess Dowager of Wales at Kew. Views of these gardens and buildings were published in book form by Chambers in 1763, but it was his extremely able and learned "Treatise on the Decorative Part of Civil Architecture" that first brought him into repute as an author-architect of great scholarship and refined taste.

Chambers was largely instrumental in the establishment, in 1768, of "The Royal Academy of Arts in London," of which institution he was the first treasurer.

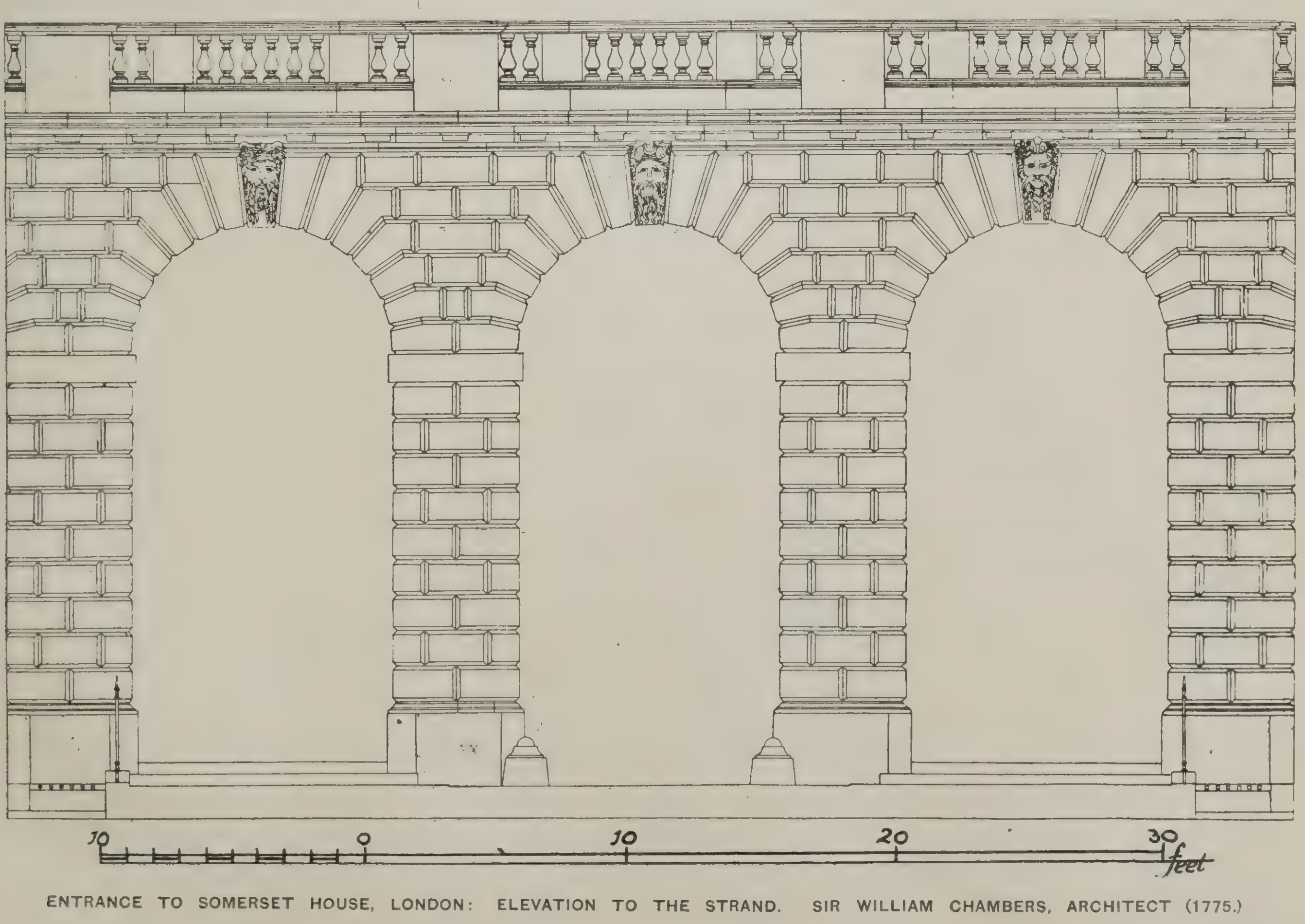
In or about the year 1775 he was commissioned by the Government to prepare designs for re-building Somerset House, and it was by his magnificent conception of this building, although its dignity and grandeur are weakened in some degree by the multiplicity of its parts, that his reputation was permanently established.

In this issue we reproduce some measured drawings of the main entrance to the building from the Strand. This portion, that has been so often and so deservedly admired, forms the central feature of a well-designed facade, consisting of a rusticated ground floor above which is a Corinthian Order, carried through two storeys and finished above the entablature, for two-thirds the length of the building, with an open balustrade. The balustrade, unfortunately, stops rather abruptly against the sides of a central attic storey which has been introduced with great detriment to the architectural beauty of the facade.

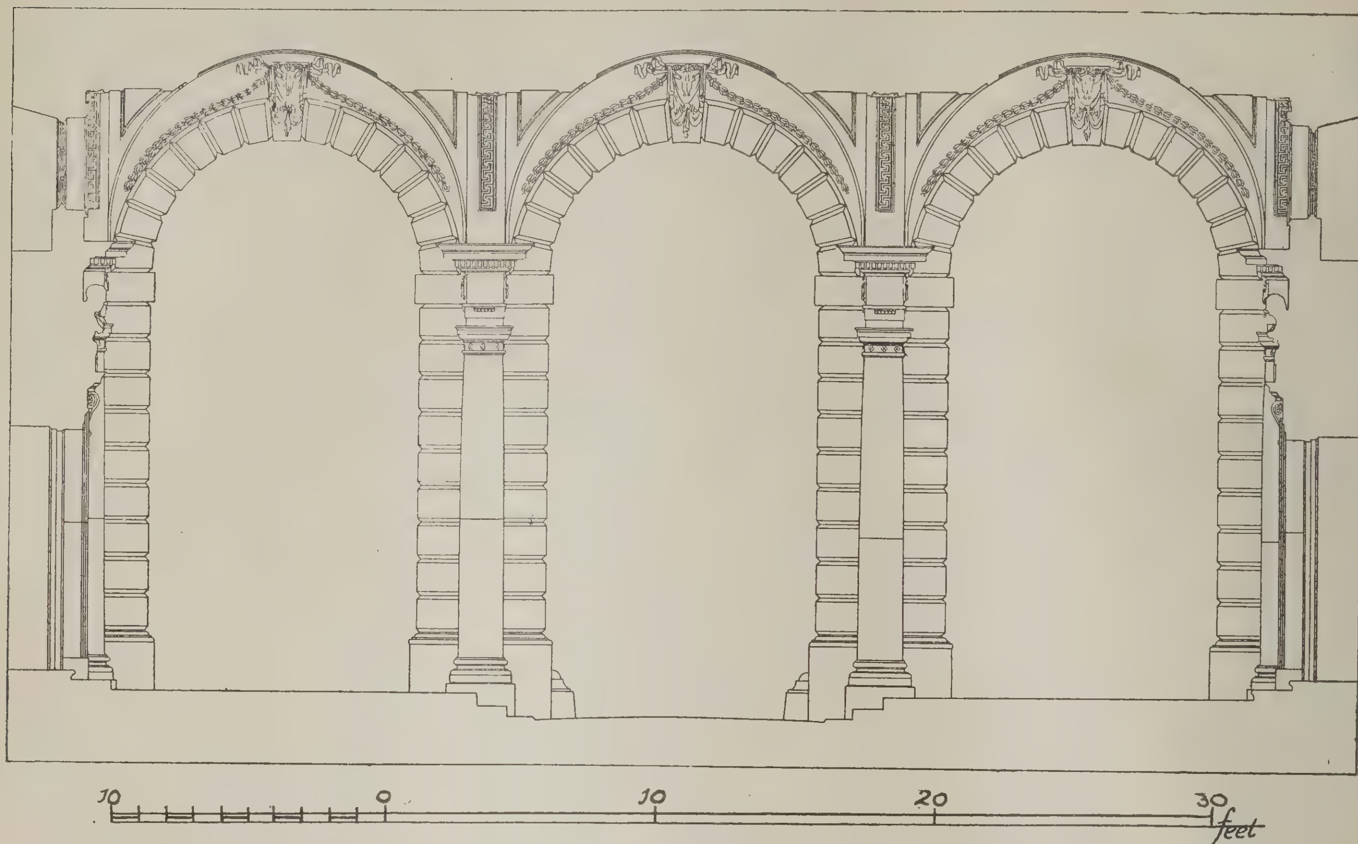
The general design of the gateway is said to have been suggested by that of the Farnese Palace at Rome, but whilst there are certain points of resemblance between the two structures, nothing approaching servile copyism is anywhere apparent. On reference to the illustrations it will be seen that the entrance consists of three vaulted arcades, of equal width, separated by coupled Doric columns supporting an enriched entablature, above which rise the graceful contours of the elaborately ornamented circular ceilings. The central arcade forms the carriage drive, whilst the two side bays serve as public footways. The enclosing walls (east and west) of these footways have four groups of three-quarter columns, responding to the coupled columns of the central arcade, and supporting a regularly continued entablature. Between these engaged columns there are three very finely-designed doorways, of which the central one is ornamented with a bust; the wall space of each bay immediately above them being pierced by three small circular windows.

Although this entrance is a most scholarly, refined, and charming effort of design, yet one is compelled, albeit very grudgingly, to admit the justice of Mr. Blomfield's criticism, namely, that whilst it is, in itself "a very accomplished piece of Classical detail," yet it has "no relation whatever to the rusticated ground storey of the Strand front."

On another occasion we hope to discuss, and to fully illustrate, some of the many



ENTRANCE TO SOMERSET HOUSE, LONDON: ELEVATION TO THE STRAND. SIR WILLIAM CHAMBERS, ARCHITECT (1775.)



THE STRAND ENTRANCE TO SOMERSET HOUSE: CROSS-SECTION LOOKING TOWARDS COURTYARD.

other beautiful examples of design to be found in this magnificent building, which was erected in 1776-1786 for the official accommodation of various Government departments.

R.I.B.A. STUDENTSHIP DRAWINGS.

The annual exhibition of designs and drawings submitted for the 1907-8 prizes and studentships of the Royal Institute of British Architects will be opened on Tuesday next, January 21st, in the gallery of the Alpine Club (entrance from Mill Street, Conduit Street, W.). The awards will be made known at next Monday's meeting of the Institute.

As a rule the main gallery of the club is sufficient for the display of the drawings submitted, but this year the entries are exceptionally numerous, so that in order to find the necessary space the staircase leading to the gallery has been utilised, as well as a room on an upper floor. In the upper room will be shown the hospital designs sent in for the Henry Saxon Snell prize: these are particularly interesting as being the first submitted in this new competition.

For last year's prizes and studentships there were 60 entries and 269 strainers. This year there are 94 entries and 444 strainers.

The following is the list of entries:—

Essay Medal ("The Function of Colour in Street Architecture"), 4.

Measured drawings Silver Medal, 15.

Soane Medallion ("A Custom House on a Quay") 28.

Owen Jones Studentship, 3.

Pugin Studentship, 12.

Tite Prize ("An Open-Air Theatre"), 14.

Arthur Cates Prize, 1.

Grissell Gold Medal ("An Elevated Water Tank in Reinforced Concrete"), 9.

Godwin Bursary, 3.

Henry Saxon Snell Prize ("Hospital Design and Construction"), 6.

The exhibition will remain open (from 10 to 8) until Saturday, February 1st.

Our Plate.

The Fellows' Building, King's College, Cambridge: Centre Portion of West Front.

The work designed by James Gibbs at Cambridge comprises the Senate House (1722-1730), intended to form part of a group of buildings which was also to include the Royal Library, and the Consistory and Registry Court, and additional buildings for King's College. These additions were to consist of blocks of detached buildings abutting on three sides of a large quadrangle, 282ft. by 24ft. one side of which was already occupied by the magnificent Late Gothic college chapel, but, eventually the west block only was completed. We reproduce this week the detail drawing made for the central portion of this example of Gibb's work, which is of such fine architectural quality as to merit the closest study.

ILFORD EMERGENCY HOSPITAL COMPETITION.

We give below a summary of the conditions of the competition for an emergency hospital to be erected at Ilford. The conditions in full can be obtained from the hon. secretary of the Governors, Mr. B. Henderson, 24, Mansfield Road, Ilford (deposit £1).

The Governors desire to receive competitive plans sections and elevations of a complete hospital, comprising sufficient space to accommodate patients and staff for 100 beds.

The funds at the disposal of the Governors being limited, they will not be able to erect, at present, the complete building, and they propose therefore, in the first instance, to provide parts of two permanent wards, each part to be sufficient for 10 beds, and to build only as much of the administrative block as may be required for the carrying on of the administrative work in connection with 20 patients. Architects are therefore requested to show how this can best be effected, by distinctively colouring such portions on their plans, always bearing in mind that the minimum of structural alterations shall be necessary as the building is proceeded with to completion.

The Governors hope that the buildings now required may be secured at an expenditure of £5,000 or less.

The building must be thoroughly substantial in all parts; but no extravagant features must be indulged in, nor must there be any unnecessary expenditure in fitting-up the operating theatre, bathrooms, lavatories, closets or mortuary.

It is hoped that it will be possible to provide all wards on the one (ground) floor only.

The floor space per bed in the wards must not be less than 133 sq. ft., and the cubic space per bed need not exceed 1,500 cub. ft. The ceiling height of the wards need not exceed 12 ft.

Drawings required:—Plans, sections, elevations, and roof plans drawn to 1-8th scale; and a block plan, to the scale of 1in. to 50ft., or larger.

Estimates required for (a) the complete hospital, and (b) that portion which it is proposed to build at present.

An assessor will be appointed.

The Governors do not bind themselves to carry out any set of plans; but the set placed first by the assessor will receive a premium of £75; that marked second, £50; and that marked third, £25.

Should the Governors decide to employ the architect whose plans may be placed first, second or third, and to carry out his plans, whether modified or otherwise, then such architect will receive 5 per cent. on the cost of such portion of the work as may be carried out at the time; and either of the premiums named above will merge in the 5 per cent. commission.

Such commission shall include the preparation of all plans, working drawings, details, specifications, etc., as may be required by the contractor and clerk of the works; and as may be necessary for the proper carrying out of the work.

The architect of the first portion of the work must understand that the Governors cannot bind themselves to employ him in any further portion, although it will be their earnest desire to do so.

Designs have to be submitted by May 31st next.

Questions about the competition will be answered up to February 28.

Notes on Competitions.

A New Qualification in Competitions: Physiognomy.

Readers will recollect the centre plate which we published a short time ago giving the portraits of the architects selected to compete in the final competition for the London County Hall. This plate has moved our contemporary the "American Architect" to make a new suggestion in regard to competitions, for we read the following in the issue for December 28th, just to hand: "The portraits of

the eight specially invited competitors exhibit men of age, character and experience, as would naturally be looked for in the case of leading architects of the day. The portraits of the twenty-one men who go to make up the fifteen firms selected in the primary competition reveal that twelve of them can hardly have passed more than twenty-five summers, and half of these twelve are not even Associates of the Royal Institute of British Architects. These youthful faces, though unmarked by time and effort, are in their alertness and promise quite as interesting as those of the older men. What this collection of portraits suggests is that here is information, afforded belatedly, to which the promoters of this competition perhaps had a right at an earlier stage in the negotiation, and as much could be said for the promoters of any other competition. . . It might in many cases be very helpful to the expert-adviser who is called on to present several designs with recommendations to the building-committee, if he could know what kind of man was represented by a given competitor's name. It would be an amusing condition to add to those usually found in competition programmes that the usual sealed envelope should contain not only the name, but the photograph of the designer."

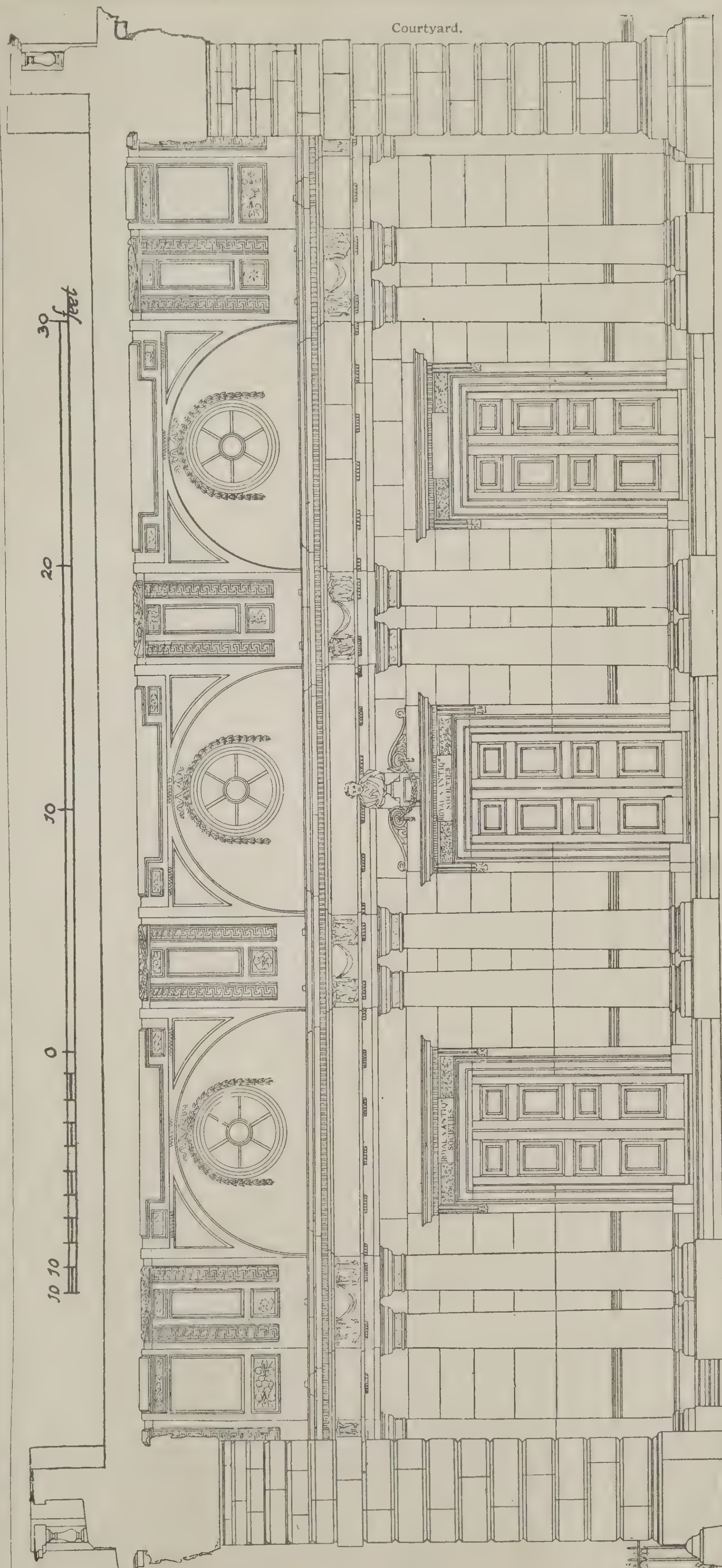
Municipal Buildings, Stirling.

Messrs. Salmon and Son and Gillespie, of Glasgow, have been awarded the first premium (£50) in this competition; Messrs. Stewart and Paterson, of Glasgow, the second premium (£30); and Mr. Alex. Wingate, of Glasgow, the third premium (£20). The designs were assessed by Mr. William Leiper, R.S.A. They will be on exhibition on Wednesday next, January 22nd, at the Smith Institute, Stirling.

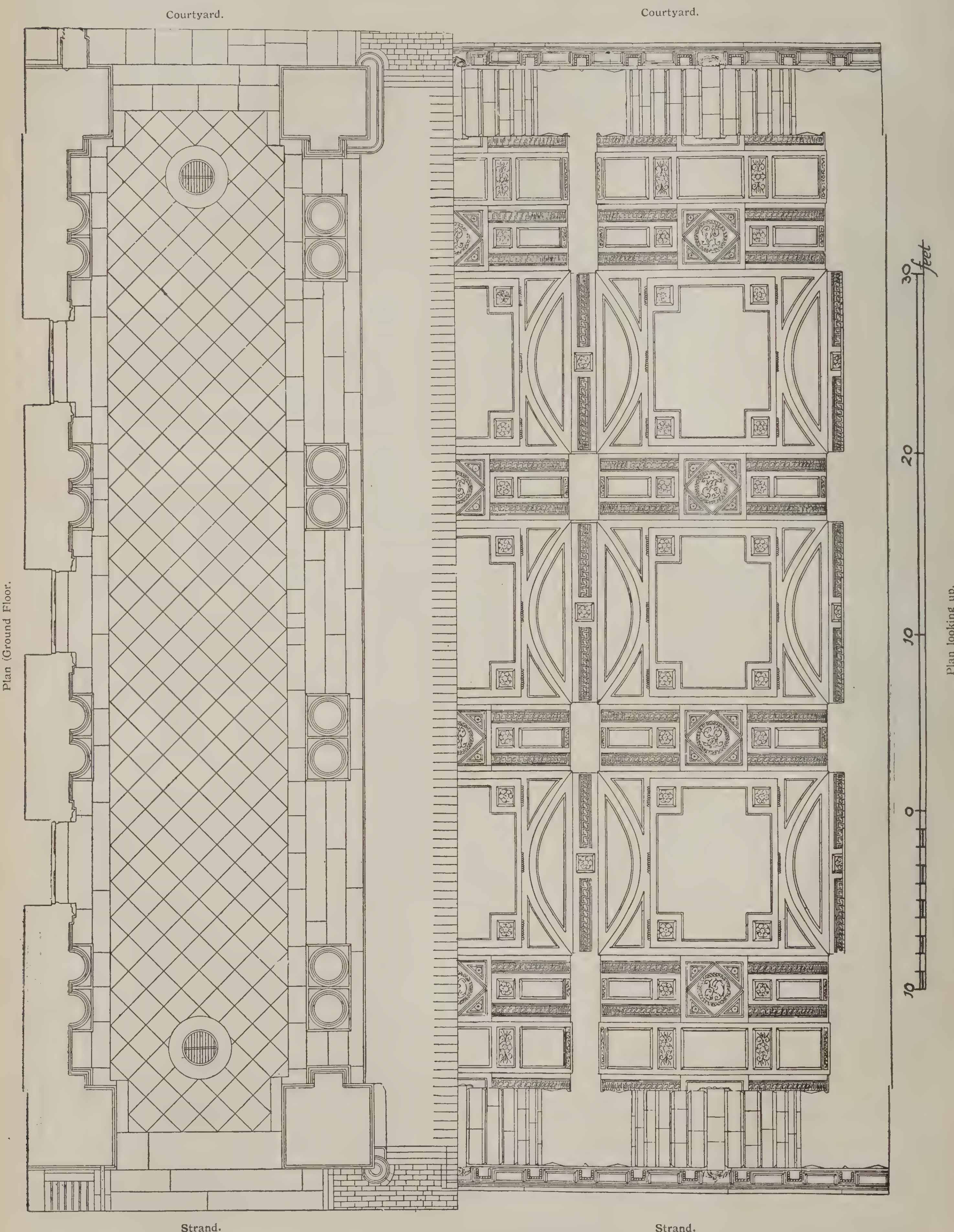
LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
Jan. 18	SCHOOLS AT OLDBURY.—Names and addresses of intending competitors by this date to S. Vernon, Secretary, Public Buildings, Oldbury.
Feb. 1	BRANCH BATHS AT ROCHDALE (to cost £7,500).—Premiums £25, £15 and £10. Assessor will be appointed. Conditions from S. S. Platt, Borough Surveyor, Rochdale. Deposit 10s. 6d.
Feb. 1	SECONDARY SCHOOL FOR BOYS AT MAIDENHEAD.—Premiums £100, £50 and £25. Assessor to be nominated by President of R.I.B.A. Conditions from the Secretary, Berkshire Education Committee, The Forbury, Reading. Deposit 5s. Summary in BUILDERS' JOURNAL, December 11th.
Feb. 1	CITY HALL AT PERTH.—To cost £25,000. Premiums £50, £30 and £20. J. J. Burnet, A.R.S.A., F.R.I.B.A., Assessor. Deposit, One Guinea.
Feb. 15	MUNICIPAL BUILDINGS AT SHANGHAI. — Conditions, together with site plan, may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.
Feb. 17	NEW COUNCIL OFFICES, &c., AT RADCLIFFE.—Limited to architects in Lancashire. Assessor, Mr. G. H. Willoughby, F.R.I.B.A. Premiums £75, £50, and £25. Conditions from S. Mills, clerk, Council Offices, Radcliffe, Manchester.
Mar. 7	SECONDARY SCHOOL AT LOWESTOFT.—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft.
May 31	EMERGENCY HOSPITAL AT ILFORD —Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1.
No Date	ADMINISTRATION OFFICES AT PONTYPRIDD, for the Guardians.—Conditions from William Spickett, Clerk, Union Offices, Pontypridd, on or before January 31. Deposit £2 2s.



THE STRAND ENTRANCE TO SOMERSET HOUSE: LONGITUDINAL SECTION THROUGH CENTRE ARCADE.



THE STRAND ENTRANCE TO SOMERSET HOUSE, LONDON.

A CRITICISM OF SOME RECENT HOSPITAL PLANS.

It is a feature of our contemporary "The Hospital" to criticise in a very free and, we must say, a very authoritative manner the plans of new hospitals in various parts of the country. We have thought it interesting to architects, therefore, to abstract from the issue of January 4th the following criticisms of important new buildings of this class.

After referring to the practical rebuilding of the London Hospital, which has entailed an expenditure of nearly half a million sterling, and the reconstruction of Guy's Hospital at an expenditure of about £350,000 (the latter being cited as "an example of hospital finance at its best"), our contemporary goes on to refer to various other London hospitals.

King's College Hospital.

Mr. W. A. Pite's design for the rebuilding of King's College Hospital at Camberwell is spoken of with approval, his plans showing "a grasp of the subject and a knowledge of detail which were only approached by one other competitor, whose plans were placed second. No hospital building of anything like the importance of this one has been undertaken in London since the erection of St. Thomas's Hospital, some forty years ago."

"Bart's."

The new out-patients' block at "Bart's" (Mr. E. B. I'Anson, architect) is referred to as being "thought out with great care; and, while it cannot be said to show extravagance, no expense has been spared to make it complete and up-to-date."

The London Fever Hospital in Liverpool Road is undergoing partial reconstruction which will, it is hoped, "bring it into line with the best fever hospitals in the country."

The new building of the City of London Lying-in Hospital in the City Road (Messrs. H. H. and M. E. Collins, architects) is admitted to be a vast improvement on the old building, "though the policy of retaining the hospital on so unsuitable a site may be questioned."

Edmonton Workhouse Infirmary.

Mr. Stuart Hill's selected design for the new workhouse infirmary at Edmonton is criticised very severely. Our contemporary says: "The buildings are very crowded on the site and the aspect of all the ward blocks, without exception, is east and west, instead of being north and south. On the face of it, there does not appear to be any valid reason for this arrangement. The site is a spacious one, apparently open on all sides, and it certainly would seem that a much superior plan might have been devised. Now that the nursing and the treatment in these Poor-law infirmaries is so very much improved to what it used to be, it seems a most unfortunate thing that a new building like this should be projected, which really is very much behind the times in point of proper hospital planning."

Glasgow Royal Infirmary.

Turning to the provinces, our contemporary refers to the Glasgow Royal Infirmary, which is being rebuilt from plans upon a scheme prepared by Sir Henry Burdett and Dr. D. J. Mackintosh, in conjunction with Mr. James Miller, who are jointly responsible for the plans. "The admission block is a novel feature. We believe that this block is likely to form a new unit in hospital construction, and that the whole scheme, which contains many novel features, will be found very helpful to those interested in hospital construction, when the whole of the plans are published."

Manchester Royal Infirmary.

With regard to the rebuilding of the Royal Infirmary at Manchester, the opinion is expressed that the site (on Oxford Road) is "certainly a very inadequate one, and the buildings cannot fail to be crowded. Mr. E. T. Hall was appointed architect after a limited competition; but the wisdom of the decision is open to grave doubts, and certainly the published plans show one very important error, namely, the double corridor from which the wards are approached. This arrangement, which adds just 100 per cent of unnecessary length to the corridors, must increase enormously the difficulty of supervising and of administration."

Children's Hospital, Sunderland.

In connection with Messrs. Armstrong and Wright's selected plan for the large children's hospital to be erected at Sunderland it is pointed out that "the mistake has been made of placing the outpatient department under one of the wards. Whether this arose from want of space or from a mistaken idea of economy we do not know; but it is a most unfortunate error. It is more necessary to isolate completely the out-patient department in a children's hospital than in any other, and this cannot be efficiently done if it is placed in the same building as the wards."

In the plans of the new nurses' home at the Wolverhampton General Hospital (for which Mr. Arthur W. Worrall was the successful competitor) our contemporary sees nothing specially remarkable, though they appear to answer the requirements "fairly well."

The new Public Dispensary at Leeds (Messrs. Bedford and Kitson, architects) is considered to be "very carefully thought out and well contrived. The lighting of every part is specially commendable."

Manchester Skin Diseases Hospital.

The new hospital for skin diseases at Manchester (Messrs. Thomas and Percy Scott Worthington, architects) is described as "a very excellent and well-planned hospital . . . and there is no skin hospital in London to compare with the one in question."

Mr. John Ely, F.R.I.B.A., the successful competitor in the competition for the remodelling of the Royal Infirmary at Salford, is commended for showing "considerable knowledge of the subject and much skill in dealing with a restricted site."

THE ARCHITECTURAL ASSOCIATION CAMERA AND CYCLING CLUB is to be known in future as the "Camera and Sketching Club." A "sketching postal section" is to be formed, in connection with which it is intended to circulate among members portfolios of sketches every month for mutual criticism and interest. Another new scheme is an "Architectural Touring Bureau," the object of which is to give information regarding sketching tours in different parts of the country.

A SERIES OF SHORT LECTURES ON PORTLAND CEMENT, its manufacture and use, with practical illustrations of briquette making, testing, etc., are being given by the Associated Portland Cement Manufacturers (1900), Ltd., at their Wharf, 143, Grosvenor Road, Pimlico, S.W. The Company will be pleased to send the date of the next lecture, with a card of admission, to anyone in the trade who cares to apply to their head office, Dixon House, 72, Fenchurch Street, London, E.C.

Correspondence.

Architectural Models.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—I beg to offer the following additional particulars in further reply to the enquiry about architectural models on page 33 of your last issue.

A rough skeleton of the model required should be first constructed and securely fixed to a firm base, so that a strong foundation is provided to work upon. This may well be of wood, and all the larger projections and the main portions of the roof will be more easily worked if they are constructed of soft wood. Cardboard alone, especially after it has been painted on one surface and so become warped, is apt to be very troublesome to work without firm internal support.

A large amount of the inking-in and painting of the model will perhaps be more easily applied after the model is completed.

Too much reliance should not be placed upon colour to obtain the effects of different materials, but efforts should be made to realise these. Cement may be used and cast in moulds for stonework. Wooden columns may be formed with pencils of equal thickness, and tapered if desired by rubbing with sand-paper.

If the model is to ⅛in. scale, ordinary wooden matches will represent window frames. The glazing can be formed of flat or roll photographic films which have been exposed to daylight and developed; and on the film glazing bars or leaded lights may be painted.

Leaded flats may be covered with the lead or tin foil wrappings from tobacco packets. Roofing slates or tiles can be cut out either singly or in courses from cartridge paper and pasted upon the model.

Any modelled or moulded work should be in modelling wax rather than "Plasticine," for a touch will spoil the latter, unless indeed there is an efficient method of setting and fixing it.

Eaves gutters and downpipes are difficult to contrive on a small-scale model, and they may have to be represented by painting; but weather-boarding, joinery, and other woodwork may easily be formed of the actual material.

Yours truly,

I. HERBERT HULME.

Neath.

The Church of St. Mary-at-Hill.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—May I advert very briefly to the reference to St. Mary-at-Hill in Mr. Keen's paper on Wren's City Churches, reported in your issue for January 1st? It is assuredly a beautiful building, and one of which we are all proud, but still more beautiful to the eye of those who look beneath the surface is the crowd of the poorest of the people who throng our precincts Sunday after Sunday. I cannot but believe that Wren's pure aspiring soul would have rejoiced at the sight of these destitute people being built up as living stones into the church. For their sake, I am sure he would have allowed the magic-lantern, band, and other accessories (we do not plead guilty to tea-cups in church), even though they may, to some extent, mar the beauty of the material fabric.

Yours truly,

EDWARD RAINBOW, M.A.,
Warden of Church Army Training Homes.

THE ARCHITECTURAL ASSOCIATION.

Sir Charles Nicholson on Earthquake-proof Buildings.

A meeting of the Architectural Association was held on Friday evening last at 18, Tufton Street, Westminster, the chair being occupied by the president, Mr. Walter Cave, F.R.I.B.A.

Messrs. W. G. Mooney (Penge) and Mr. S. H. Rainforth (Lincoln) were elected members of the Association.

A paper on "The Kingston Earthquake and Building in Jamaica" was then read by Sir Charles Nicholson, F.R.I.B.A.

After stating that in May last he had been asked by the newly-appointed Governor of Jamaica to go out to that colony with him in order to discuss certain matters concerning the reinstatement of the buildings destroyed by the recent earthquake, Sir Charles went on to describe a few of the buildings in which the shock had been most severely felt, and then to indicate the lines upon which reconstruction seemed desirable in a climate such as that of Jamaica (where, excepting in the hills, it is never cool in the daytime) and in a locality subject to frequent hurricanes and occasional earthquakes. The climate, however, simplified the minor difficulties of planning, as fireplaces were nowhere required, except in kitchens, hot-water systems were unnecessary, draughts were to be courted rather than avoided, and even window glass was only needed as a protection against storms and dust.

Sir Charles mentioned that very little had been written about construction in earthquake countries, the best-known authority being Professor Milne, whose unique knowledge had been acquired in Japan.

The exact nature of the earth movements that had recently convulsed Kingston had not been definitely pronounced upon, but the effect on the buildings was that of a battering ram working east and west; thus, the side walls of the churches were merely cracked, while their end walls were almost invariably overthrown bodily. As might naturally be expected, the churches suffered more severely than the civil buildings, and it was remarkable to note, in connection with the latter, what a number of roofs had withstood the shock, which might be attributed to the fact that the majority of them were of light scantlings and covered with wood shingles. The advantages of a light and tenacious form of roofing therefore were very great, and the use of wall-posts carrying a roof from the ground level was also to be recommended.

How Arches Withstood the Earthquake.

"Professor Milne, from his experience in Japan, condemns the use of arches, and recommends a traveated construction. But the effects of the Kingston earthquake go to show us that all openings are a source of danger; whether there are lintels or arches they act as battering rams and cause diagonal cracks in the piers between the openings. . . . Semicircular arches behaved fairly well in cases where there were good abutments, and where the supporting piers did not fall down. Of properly-built pointed arches without keystones and with concentric rings there are none in the island. Probably such arches would have stood well. The semi-circular arches in Kingston are generally bonded and not built in independent rings . . .

Undamaged Buildings.

"There are several buildings in Kingston which were practically undamaged. Of such was a large three-storeyed warehouse of ordinary substantial construction, with posts supporting the floors and with a slight queen-post roof. Another case is that of the tramway company's power house, a large, plain, ugly room, without internal supports, about 25ft. high to the wall-plate. It is built of brickwork in cement mortar, and only shows a few cracks in the eastern gable. A large shed on the quay, built of cement concrete without reinforcement, with timber trussed roof, is also quite intact.

Timber Frame Buildings

naturally suffer very little damage. Thus at Port Royal, where the shock was very intense, and the ground subsided bodily, some of the wooden buildings took a list of several degrees without much harm being done. And, in some buildings in the town of Kingston whose floors and roofs were carried on posts and beams framed together shipwright fashion, with knees and braces, the outer brick walls were shaken down, but the floors and roofs stood and are again being used after having been temporarily closed in.

Data for Building in Earthquake Countries.

From these data one may deduce certain broad rules which may be borne in mind if one is building in a place liable to earthquakes.

First as to materials. Timber framing is reliable and is perhaps the best method of construction in rural districts, but is, of course, open to objection in towns, owing to the risk of fires; moreover, it is doubtful whether one can place very much confidence in the durability of the pitch-pine (imported from the United States) which is so much used nowadays in Jamaica, though the local hardwoods (of which the supply is very limited) are durable and excellent in every respect. Brickwork in lime mortar has proved a failure in Jamaica; the lime being very poor and the sand unsuitable for mortar-making, the resulting product is little better than dust. Brickwork in cement, however, and cement concrete, have stood well.

Steel frame buildings are well enough if their skins are well fastened to their skeletons, but there are practically no steel frame buildings in Jamaica, and one must form one's opinion as to their merits from their behaviour in other places. But perhaps

the Best Solution of the Problem

is to build in armoured cement concrete or reinforced brickwork, since for most purposes the cost of a frame building is prohibitive. A large house built of concrete made of sea shingle and mixed with salt water, reinforced with Ransome's twisted bars, has been built at Port Antonio in the north of the island. This was quite intact after the earthquake, though the neighbouring court house was seriously damaged. The shock here was certainly less severe than at Kingston; still, the test was a severe one, as several fixed baths in the house referred to were half-full of water at the time of the earthquake, and the shock was enough to cause this water to swamp the floors of the bathrooms. No damage was, however, done to the house, the walls, floors, and roofs of which are all of armoured concrete. Perhaps this may be set down to the fibrous and partially elastic nature of the material and, so far as one can judge without visiting San Francisco, the evidence to be obtained from the disaster in that place is all in favour of properly-constructed armoured concrete construction in a district subject to earthquakes.

"Free Foundations."

A very important matter is that of foundations. A great deal of the damage done in Kingston seems due to the fact that, in the course of time, the streets, which have only been paved in comparatively recent years, had been worn down to a level below that of the foundations of the buildings, which were thus deprived of lateral support beyond that afforded by the slight boundary walls of their fore-courts.

The Japanese have experimented in the use of "free foundations" for some of their buildings. In certain instances ball bearings have been used, in others sand joints betwen the foundation and superstructure, but these devices have not proved a great success, and are, moreover, better adapted for framed buildings than for those of masonry. But the fact that underground constructions escaped damage at Kingston seems to indicate that a building with a sunk basement standing on a concrete raft with open areas all round it would probably have been very little affected by such an earthquake shock as was there experienced. The plan thus indicated cannot well be adopted in Kingston, however, owing to the fact that sunk basements are practically useless in so warm and damp a climate, and, furthermore, because there are no rainwater drains in the town, and therefore such basements would be frequently flooded.

Precautions Against Hurricanes: Roofs.

Now, besides the risk of earthquakes, which after all only occur once in several generations, the builder in Jamaica has to take certain precautions against the violent hurricanes which may be expected every few years. It is, therefore, necessary that roofs should be securely fastened down to their substructures. Verandahs, too, which are in very common use, must be protected against the lifting force of the wind, and the use of iron roofing sheets is a source of considerable danger, as may well be realised if one imagines a score of these products of modern enterprise hurtling pell-mell around one's back garden.

Shingles make far the safest roof in country places, while, in the towns, the ideal form of roof is a flat one covered with asphalt and a good thick layer of earth, or in some cases, a shallow water tank.

There is a local prejudice against asphalt roofs, probably due to the fact that in Jamaica this material has generally been laid on boarding without proper precautions against cracking caused by the shrinkage of timbers, and, further, without any external protection against the extreme heat. But an asphalt concrete flat with a good external covering of non-conducting material would, if properly constructed, form one of the coolest and most durable of coverings, and one, therefore, well suited to West Indian conditions.

An Indigenous Style.

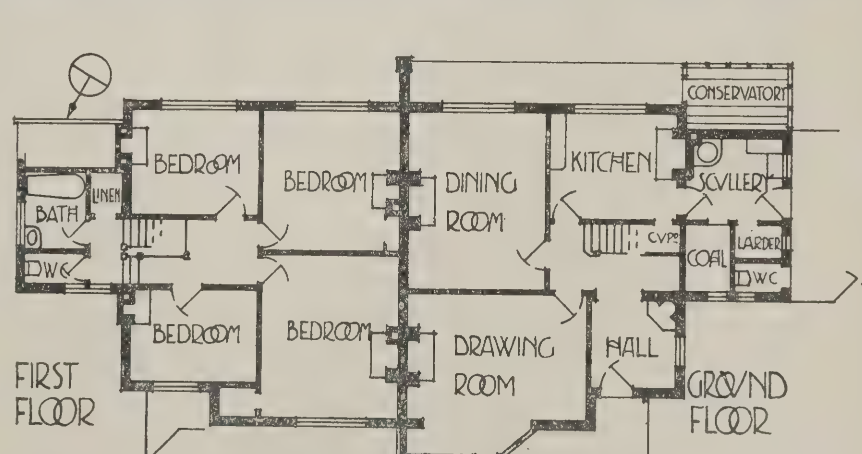
It must be confessed that English colonists have so far not succeeded in evolving a satisfactory and rational architecture for tropical climates. A very natural desire to recall the aspect of home buildings has caused the perpetration of such absurdities as Calcutta Cathedral in Strawberry Hill Gothic, and the Parliament houses at Capetown and Melbourne in corrupt Hanoverian Classic. Jamaica buildings are neither better nor worse than those of other colonies in these respects, which is disappointing in an island which was a Span-

PROPOSED HOUSES AT NORTH FINCHLEY ◇ EDWIN GUNN ◇ ARCHT

ish colony until the seventeenth century. In Mexico, Cuba, the South American States, the Philippines, and the Canaries—wherever the Spanish influence can be traced we find satisfactory tropical buildings with courts and arcades, large cool rooms, thick low walls, and flat or low-pitched roofs of good substance.

For present-day work we shall do well to study the old Spanish buildings and the excellent work of contemporary American architects in Florida, California, and elsewhere.

In conclusion, it may be said that the conditions now obtaining in Jamaica are not unfavourable to good work, and if what is now being done turns out to be a discredit to the colony the unfortunate result can only be attributed to our natural perversity and original sin. The authorities in the island are honestly anxious to get the rebuilding done in an intelligent fashion, and only the builders and architects remain to be reckoned with. How far they may succeed in nullifying the good intentions of the Government, the next few years will show us.



These houses are about to be erected on the south side of Torrington Park. They will be faced with dark-red sand-faced bricks, and roofed with unpicked Sovereign Broseley tiles, having considerable variation in colour. The front gables will be rendered in Portland cement, finished with a wood float to give texture, and distempered a warm cream tint. The external woodwork will be painted white. The architect is Mr. Edwin Gunn, A.R.I.B.A., of 76, Finsbury Pavement, E.C.

Discussion.

Mr. S. Hurst Seager (N.Z.), in proposing a vote of thanks to Sir Charles Nicholson for his very interesting paper, drew attention to the valuable researches that had been made by Prof. Milne on the subject of the action of earthquakes. As Prof. Milne had pointed out, if the earth were wholly homogeneous in character one might expect to find constant forces going on, and be able to tell what was taking place at any particular point. The fact, however, was quite otherwise.

In the case of earthquakes, there was terrific force exerted from a distance below the earth of about 10 or 15 miles, and this force sent direct vibrations upwards which spread in all directions. He thought that the greatest danger to buildings was to be apprehended when the force struck them at an angle of 45 degrees, and that a vertical one—lifting a building up and down—did not do so much damage; also that a light building vibrated more quickly than a heavy one. He regarded buildings constructed of reinforced concrete as best likely to withstand earthquake shocks, but it was, of course, a point that had still to be determined.

Mr. R. S. Balfour briefly seconded the vote of thanks.

Mr. H. C. Corlette expressed his opinion that in building suitable structures to withstand earthquake shocks, it was essential to have vertical reinforcement, and in support of his theory explained the action of the metronome, to the oscillations of which earthquake vibrations were very similar.

Mr. Henry Tanner, jun., and Mr. S. Nélle (Kingston) also spoke.

Sir Charles Nicholson, in acknowledging the vote of thanks, observed that Prof. Vaughan Cornish had arrived at the conclusion that so far as Kingston was con-

cerned, there were two foci of the earthquake shock, one being a little way to the south-east and the other somewhere to the north. The parish church, situated in the area of the secondary power, was, with the exception of the east wall and west tower, very little damaged. In Jamaica no special reinforcement was used, and from his observations there he regarded underground buildings as the safest, and suggested that if one built a swimming bath and erected a building in the centre, it would stand a good chance of resisting earthquake shock; at the same time he was convinced that if an earthquake happened to be of stupendous nature, no human power could construct a building able to stand against it, and it was fortunate for humanity that in the majority of cases such shocks arose far out at sea, and in consequence did little damage on shore.

Views and Reviews.

Class Note-Books on Building Construction.

Some time ago we reviewed the first of a series of most useful building construction class note-books drawn up and published by Mr. A. Buchanan, instructor in building construction at the Battersea Polytechnic. Since then Mr. Buchanan has proceeded with his scheme and has had Mr. W. H. Hudson (his assistant at the Battersea Polytechnic) to help him with the compilation: so that we now have before us the first six note-books. They consist of diagrams in the form of plates, each one of which is faced by a sheet of squared paper. In using these note-books teachers have, as a rule, taken one plate as the basis of a lesson, and amplified the subject by blackboard sketches, diagrams, models, etc., the sketches and notes being copied by the students on the sectional ruled paper. This proves to be of great assistance, furnishing the students with a most valuable collection of notes by the end of each course. Parts 1, 2, and 3 of the series apply to Stage I. of the building construction syllabus of the South Kensington examinations; and Parts 4, 5, and 6 apply to Stages II. and III. of the same. Each part contains sixteen plates, interleaved with sectional ruled paper. A seventh part is in preparation, dealing with "Iron and Steel Construction." The most valuable feature of these note-books is that the diagrams are thoroughly practical and up-to-date, whereas almost all the text-books on building construction are behind the times. These note-books, therefore, not only supplement the ordinary well-known text-books on construction, but supplant them in great part by more efficient instruction. If there is one criticism we must make, it is that the diagrams would be better reproduced to a larger scale, and that the lettering might be made neater and more distinctive.

Building Construction Class Note-Books, with diagrams: Parts 1 to 6. By A. Buchanan and W. H. Hudson. London: A. Buchanan, 2, Thurleigh Road, Balham, S.W.; or W. H. Hudson, 64, Childebert Road, Balham, S.W. Price 1s. each.

Shop Fronts.

Shop fronts constitute an interesting part of architectural design to which insufficient attention has been given by the majority of architects; very few architects indeed, have given serious attention to this class of design. The majority of shop fronts have been in the hands of trade firms who have not made great efforts to improve public taste; they have, however, of late years been forced to display a little more originality, and the designing of shop fronts is undoubtedly improving. This work, therefore, is a useful one, but it is by no means exhaustive. The historical examples are almost all confined to London, and the book does not provide an adequate record of the many excellent old shop-fronts to be found distributed in various parts of the country, chiefly in the small old-world towns. The selection of modern examples is also mostly confined to London, so that the book is not a comprehensive review of modern work. The practical side of the subject is dealt with rather better, much useful information being given. In passing this criticism upon the work, we do not wish to infer that the volume is of little value; it contains much valuable information, and is the first attempt, so far as we are aware, to deal with an important subject in a worthy manner, and as such it is a complete success. This success is greatly attributable to the publisher, Mr. Batsford, for the admirable get-up of the work; the photographs are good, and are reproduced in the best manner by collotypes.

"English Shop Fronts, Old and New." By Horace Dan, M.S.A., and E. C. Morgan Wilmott, A.R.I.B.A. London: B. T. Batsford, 94, High Hoborn, W.C. Price 15s. nett.

A New Book on Ventilation.

Dr. Shaw is an authority of considerable repute on the subject of ventilation, although he is best known to the public as Director of the Meteorological Office, in which capacity he investigates what may be called ventilation on the large scale. As long ago as 1890, in a paper which he read before the British Association meeting at Leeds, he pointed out the analogy between the physical phenomena of ventilation and the distribution of electric current in a network of conductors. Since then he has carried the electrical analogy further, and this book shows how we are able to understand many of the problems of ventilation by explanations based upon electrical theory. Dr. Shaw devotes his chief attention to an explanation of the physical laws of pneumatics in their relation to ventilation, and he places the subject upon a scientific basis that offers some hope of more adequate knowledge and better practice in the future. Specialists in ventilation as a rule have approached the subject from other points of view, such as the hygienic one of so many cubic ft. of air required per person per hour, and the temperature at which the air should be maintained to secure good health. This side has been exhausted. The real difficulty is to secure the required change of air, and to distribute it uniformly in compartments of a building. Dr. Shaw, after considering the various problems presented, comes to the conclusion that ventilation without draught requires a large air supply: he puts the matter in a paradoxical form when he says that if complaint is made of a draught the remedy is not to supply less air, but to supply more. The explanation is that air is required to wash away the surplus heat, as well as the surplus impurity, and that the draught may be due to the united effects of convection and the assembly of persons, and that these effects of convection are less if there is more air to work with. In his preface, Dr. Shaw says that the book contains his last word on the subject, and that he has written down in the volume all that he knows, and perhaps added a good deal that he has guessed, with the hope that it will enable others to take up the consideration of ventilation questions on the basis of electrical analogy, with due regard to the physical condition of the distribution of air, and thus complete the task of solving the problems of ventilation on a practical basis, which Dr. Shaw has neither time nor opportunity to do himself: in connection with which it should be stated that the application of physical laws to practical ventilation comprises the third and concluding section into which this volume is divided.

"Air Currents and the Laws of Ventilation." By W. N. Shaw, Sc.D., F.R.S. London: Cambridge University Press Warehouse, Fetter Lane, E.C. Price 3s. nett.

Two Pocket-Books on Engineering.

The 21st annual issue of the "Pocket Diary and Year Book" issued by the "Mechanical World" shows further improvement upon former issues. The notes on electrical transmission of power have in this issue been omitted, so giving room for the introduction of new matter, of which we note a lengthy section on condensing plant, and another on the important subject of superheating. The omitted information on electrical power transmission will now be found, together with much fresh matter, in a companion volume, namely, the "Mechanical World Electrical Pocket-Book," which book is specially intended for those in charge of electrical plant and machinery, for power users, and others concerned with the industrial application of electricity. The two volumes are most valuable aid books, and should be in the hands of those interested in the subjects with which they deal.

"The Mechanical World Pocket Diary and Year Book," for 1908. "The Mechanical World Electrical Pocket Diary," for 1908. Manchester: Elliott and Co., Ltd., 65, King Street. Price 6d nett each.

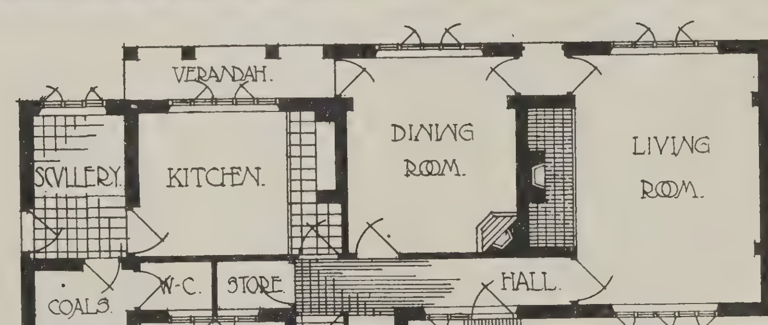
The Building Materials of Rome.

This work performs a great service in placing on record some particulars of the various building stones to be found in the remains of ancient Rome. The classification is extremely well done, and the particulars afforded are highly interesting as well as instructive. The authoress has consulted a great many authorities, and has collected references by early Roman authors that bear upon the uses of the various materials. Most of the materials referred to are marbles; certainly the use of marbles was more extensive in Rome than in any city before or since.

It was the boast of Augustus that he "found Rome of brick but left it of marble," and Prof. Lanciani has estimated that the number of marble columns landed at Ostia in ancient times was 450,000 at least, and as columns represented but a small item in the marble trade of Rome the quantity of the material used must have been enormous. Rome was despoiled of much of its marble in the Middle Ages, and within recent times a great deal of destruction and breaking-up has taken place, while large quantities have been burned to produce lime. Columns have been found measuring 6 ft. in diameter and 55 ft. in height; and blocks weighing sometimes 27 tons, like the one belonging to the Temple of the Sun, now lying in the Colonna Gardens on the Quirinal. Indeed, Signor Boni informs the authoress that the blocks of Carrara marble in the pedestal of Trajan's column weigh 80 tons each. The marble was obtained from many sources, chiefly from Carrara, it is true, but large quantities came from Elba, Algeria and Tunis, Egypt, France, Greece, Nubia, Spain, Turkey in Europe, and Turkey in Asia.

In describing the various marbles and other building stones used by the Romans the chronological order has been adopted in this work, as far as possible, and subsequently the alphabetical order. The information given seems to be most accurate; the authoress has gone to great trouble to check all the facts recorded, and she has consulted several eminent authorities, so that the book may be relied upon. We should be glad to see more works of this character.

"What Rome was Built With; a description of the stones employed in ancient times for its building and decoration." By Mary Winiarls Porter. London and Oxford: Henry Frowde. Price 3/6 nett.



This small cottage has recently been built on the Wingfield Estate at Biddenham, which is on the outskirts of Bedford. The walls are of common hard-burnt local bricks, rough-cast, and the roofs are of local hand-made red tiles. All external woodwork is of deal painted white, internal joinery being of canary whitewood, unpainted, with English oak beams in living-room and dining-room. The aim has been to build as economically as possible, consistent with good work. The contract sum was £400. Mr. C. E Mallows, F.R.I.B.A., of London and Bedford, was the architect, and Mr. George Harrison, of Bedford, was the builder.

Plumbing.

In our issues for May 8th and June 5th, 1907, we reviewed the first two professional volumes of "The Modern Plumber and Sanitary Engineer." The third and fourth volumes, now before us, fulfil the promise of the first and second. Volume 3, Section 6, deals with hot-water services, being contributed by Mr. A. Herring Shaw, Assoc. R.S.I. It is clearly written, and some of the diagrams are rendered more useful by printing the various pipe lines in two or three colours. Section 7, on warming and ventilation, is contributed by Mr. Harold Griffiths, A.R.I.B.A., F.S.I., M.R.S.I., etc. This section deals with the subject very much in the manner we are accustomed to expect from text-books. The author is in favour generally of mechanical means of ventilation, which seems to be the direction in which nearly everyone is proceeding. In the comparatively small space, a mass of information and practical details are given, and this section is one of the best in the book. Section 8, sanitary plumbing and drainage, is divided between Vols. 3 and 4; it is written by Mr. E. Thomas Swinson. The subject is a somewhat difficult one to handle by reason of the many varieties of fittings on the market, but the author has done his work well, and this section will be of greater value to architects and others called upon to select sanitary fittings than it will be to practical plumbers. The subject of testing fittings, pipes and drains is, however, dealt with in a rather scanty fashion, and the notes on sewage disposal are so extremely short that it is doubtful whether they will be of any real service. Section 9, in Vol. 4, deals with mechanical and pneumatic bells and speaking tubes, and is written by Captain James Law, M.R.San.I., R.E. This is very welcome, as the subject is left un-

touched in most books on building construction. Section 10 deals with electric bells and telephones, and is contributed by Mr. F. G. Bell, A.M.I.E.E. This seems to us distinctly out of place in a book on plumbing, the majority of plumbers never being called upon to do such work, and even those few firms that do combine electrical fitting with plumbing could scarcely argue that they were only plumbers. The notes are useful, but they should have been published in some other connection.

"The Modern Plumber and Sanitary Engineer." Vols. 3 and 4. By sixteen specialist contributors, under the editorship of Mr. G. Lister Sutcliffe, A.R.I.B.A., M.R.S.I. London: The Gresham Publishing Co., 34, Southampton Street, Strand, W.C. Price 6s. nett each volume.

Scaffolding.

We are glad to see that Mr. Thatcher's book on "Scaffolding" has been so appreciated by the public as to warrant a second edition. The author is undoubtedly the foremost authority on the subject in this country. As a factory inspector to the Home Office, he has been called upon to undertake the special duty of investigating accidents on buildings in course of construction. While the scaffold is of course primarily intended for the purpose of enabling work to be constructed, the subject of safeguarding the lives and limbs of the workmen is more important than the material needs and uses, and it leads to much more complication in the details of the scaffold than is rendered necessary for the mere purpose of construction. To a great extent scaffolding remains without much improvement, methods being adopted to-day that have been in use for centuries. The derrick staging is perhaps the most striking feature of modern scaffolding, but the principle is not new by any means. In America, however, there are a few novel methods of scaffolding adopted, more in the character of suspended scaffolding from steel frame buildings, the steel frame itself not requiring an independent scaffold. Scaffolding is usually entrusted to a special class of men, sometimes under a foreman having little theoretical ability, but in the majority of cases under the supervision of a man who proceeds by the most rule-of-thumb methods, trusting to intuition and experience. The work really should be in the hands of men of greater attainments than the ordinary labourer, and no doubt the recent report of the Committee on Building Accidents, and Mr. Thatcher's book, will lead to closer attention being given to the matter by contractors.

"Scaffolding: A Treatise on the Design and Erection of Scaffolds, Gantries, and Stagings." By A. G. H. Thatcher. London: B. T. Batsford, 94, High Holborn, W.C. Price 5s. nett.

Hydraulic Rams.

Mr. J. Wright Clarke, in this second edition, has considerably altered the character of the book; a great portion of the text has been re-written, and the subject matter has been re-set and divided into chapters for convenience of reference. The whole of the illustrations have been re-drawn and other examples added to bring the work up-to-date and increase its usefulness. Architects of houses to be erected in the country often have occasion to use hydraulic rams in connection with water supply, and this book will be valuable to them and to others in affording full information on a subject seldom to be found dealt with.

"Hydraulic Rams: Their Principles and Treatment." By J. Wright Clarke. Second edition. London: B. T. Batsford, 94, High Holborn, W.C. Price 3s. nett.

MR. ARCHER'S IMPRESSIONS OF AMERICAN ARCHITECTURE.

Mr. William Archer, the well-known dramatic critic, author and dramatist, has been contributing to the "Tribune" some interesting articles on American architecture in general, and the New York skyscraper in particular. We give the following extracts:—

"One thing was evident to me before I had been a day in New York—namely, that the passion for architectural beauty and dignity which is so strong in America had taken hold even of the designers of 'tall buildings.' Those which were new to me were, as a rule, far more pleasing to the eye than those which were already in existence eight years ago. It is certainly no easy matter to make a sky-scraper beautiful. Dignity of proportion is in most cases impossible: you might as well look for athletic symmetry in a giraffe. There can be no latitudinal development of any sort, nor even any backward curve of diminution, as in the couchant lion. Mr. James is quite right in saying that a truly dignified building must have the air of being seated, whereas the typical sky-scraper is always aggressively standing.

The Aesthetic Problem,

then, resolves itself into the frontal decoration of a square column, which must be pierced with from twenty to thirty rows of windows, which windows, again, must be all, or nearly all, very much of a size. It is no easy matter to get any beauty into such a rectangular slab; and at first the New York architects made little enough attempt to do so. But latterly they have applied themselves to the task with what seems to me extraordinary ingenuity. Herr von Ihne, the Court Architect of Berlin, has recently said to his American colleagues, "You do right, precisely right, to treat these tall buildings frankly as towers." With all deference, I should rather say that the tendency was to treat the down-town sky-scraper frankly as a column, applying rich decoration to the base and the capital, while leaving the shaft quite plain, save for a system of vertical lines, equivalent to flutings, which carry the eye upwards. By this means the whole structure puts on the air of a tripartite organism; nor is it only a pretence, for I take it that the function of the decorated lower storeys and upper storeys is apt to be different from that of the intermediate floors. Sometimes the flatness of the shaft is slightly broken by cunningly distributed balconies, like the rostra on a Roman naval column. In several recent buildings the decoration of the base and capital is, to my thinking, extraordinarily beautiful. I grieve to add that in one unfinished erection (in Washington Street, if I remember rightly) close scrutiny revealed the fact that the rather effective Gothic mouldings of the lower storeys were made of cast iron, painted stone-colour, and applied to stone.

Grouping of Sky-Towers.

"The desire for beauty is shown in the fact that in one or two recent instances sky-scrapers have been grouped so as to balance each other, and thus diminish the disproportion between base-line and elevation, which is the besetting drawback of the type. The incurable weakness of the New York down-town sky-scraper, however, is disclosed when you look at it from the rear. In this aspect everything has to be sacrificed to the primary necessities of light and air, and the structure reveals itself as nothing but two or three glazed brick air shafts, with a more or less pretentious facade. Further up town, where sites are more spacious and more open, this condition is, to some extent, dissimulated.

"People are always prophesying, as did Herr von Ihne, that 'the limit of high buildings will soon be reached, and that their multiplication will soon cease.' But meanwhile they go on climbing, climbing, the beanstalks of the fairy-tale of American commerce. On every hand one sees the espaliers—the great steel frames—silhouetted against the sky. Nor do I know what is to put a stop to them, so long as they do not cluster so thickly as quite to shut off one another's light and air.

Architecture the most Living Art in America.

"That architecture is the most living art of America, and far more vital and original than in most European countries, seems to me beyond all dispute. The construction of the columnar sky-scraper, no doubt (apart from the frontal decoration), is a feat of engineering rather than of architecture. But New York abounds in buildings of ordinary proportions and of quite extraordinary beauty; and one may be pretty sure that the greater the beauty the later the date.

"It would be endless to enumerate the beautiful buildings which one sees at every turn, not only on the main thoroughfares, but even on the side streets and cross streets of New York. Moreover, it is not a little dispiriting to compare their originality with the ornate and costly commonplace of certan recent public buildings in London. At the same time, it is only fair to note that the New York architect, in the clear air of Manhattan, can use materials and indulge in surface-work which it would be wasteful and inappropriate to employ in our smoke-laden London atmosphere. As for the architecture of villas and country houses, with its ingenious adaptation of the noble Colonial style, the recent progress in this department has been even more remarkable than in that of urban dwellings.

"I have dwelt on this aspect of the American spectacle because it seems to me not only notable in itself, but something of a symbol and a portent. Architecture, in close alliance with engineering—just as we find it in New York—is surely the art of the future. It is the communal art—the art in whose triumphs all may rejoice, in whose benefits all may share.

The World of the Future

must be remade by the engineer and the architect, very much as New York is being remade before our eyes, though doubtless in different forms. In this, as in other aspects, I see in America a great rehearsal, though doubtless a blind and blundering one, for the age that is to be. As yet the stage-management is very defective; but when the organizing genius shall appear, he will at least find in America a stage on which all material difficulties are proved to be conquerable, and no encumbrance is suffered to block the way."

Mr. Reginald Blomfield's Academy Lectures — Mr. Reginald Blomfield, A.R.A., in his capacity of Professor of Architecture, will give a second series of lectures at the Academy next month. There will be four lectures on "The Grand Manner," as illustrated in (1) Egypt and Greece, (2) Pergamos and Hellenistic Art, (3) Rome, and (4) France. The lectures will commence on February 17th.

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

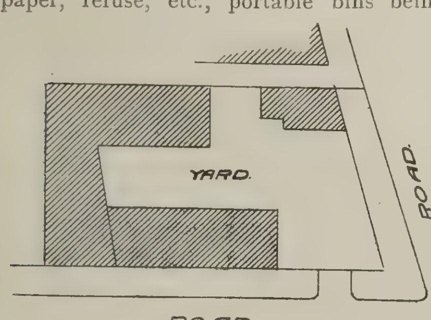
Library Design.

1908 writes: "Please suggest a good practical book on library design. In which issue did you review 'Public Libraries,' by Mr. A. L. Champneys? I shall also be glad to know of any recent articles on the subject."

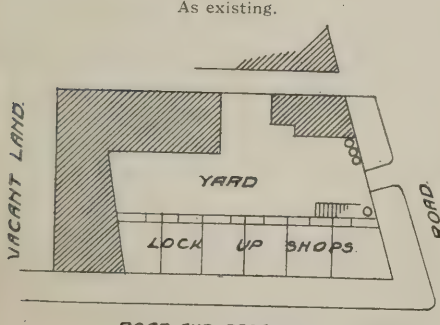
Our review of Mr. A. L. Champneys' book on "Public Libraries" appeared in the issue for May 22nd last. This is the latest book on the subject, and the one we should recommend you to get. It is published at 12s. 6d. nett, and can be obtained at that price from these offices. The most recent papers read on the subject were those by Mr. Henry T. Hare and Mr. J. Duff Brown at the meeting of the Royal Institute of British Architects held on March 18th, 1907; a report of these papers appeared in our issue for March 20th last. Another paper, read before the Architectural Association by Mr. Alfred Cox, you will find reported in our issue for January 11th, 1905.

Yard Space to Lock-up Shops.

BIRKENHEAD.—H.E.H. writes: "A client of mine owns the land and buildings shown on the accompanying plan. He desires to build six lock-up shops, as indicated, with a workroom over. Plans have been submitted to the Roads and Improvements Committee, who, however, will not pass the plans because the shops have no separate yard spaces (my client needing the whole yard for his business). It is impossible to give separate yards to each shop, although the tenants would have the use of the yard for the disposing of any paper, refuse, etc., portable bins being



As existing.

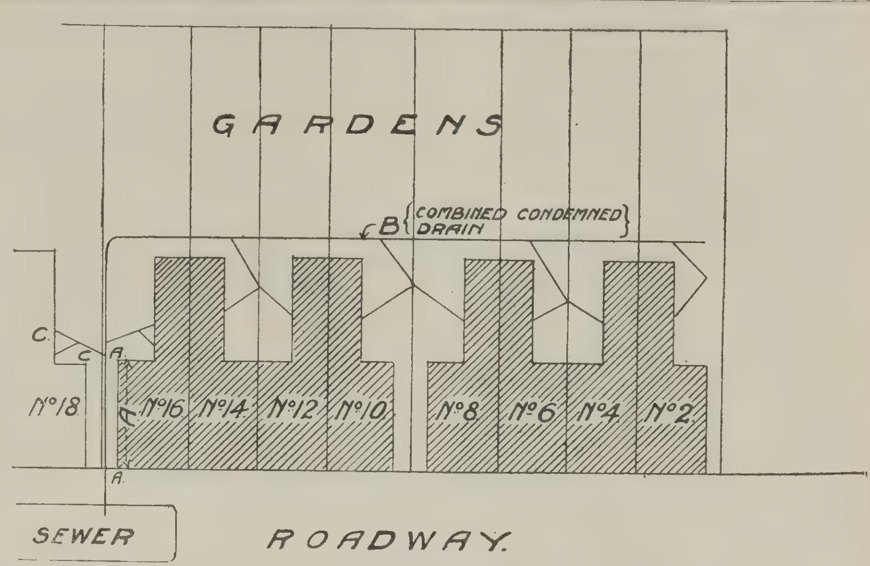


ROAD AND ERECTION OF SHOPS.
As proposed.

provided for that purpose. The Committee have already passed a plan for a bank and lock-up shops upon exactly the same lines, the reason given for the passing of these plans being that a large price had been paid for the site."

The by-laws you quote are based upon the Model By-laws of the Local Government Board, and are not in any way of exceptional stringency. The council are perfectly justified in refusing to approve your new building plan, because it is quite evident that in no single case have you provided "an open space *exclusively* belonging to such building." The fact that the town council have previously permitted the erection of a building embodying similar planning to that you now propose does not in any way vitiate their right to strictly enforce the by-laws subsequently, and you cannot therefore oblige them to again waive their regulation with regard to air-space.

F.S.I.



HOUSE DRAINAGE.

House Drainage.

X. writes: "In your issue for July 24th last, you were good enough to give me an opinion on a drainage question, but as the circumstances have taken a new turn I approach you once more in the hope that the further particulars may enable you to settle the liability. The owners of the houses having neglected to carry out the required repairs to the drain, the local authority undertook the work, placing it in the hands of a contractor. Previous to the work being commenced, the town clerk, in the course of conversation, remarked that should the plans in their possession be incorrect, the liability to repair the drain, *ipso facto*, became theirs. After the work was commenced it was found that their plan was incorrect, as the drain from No. 18 ran into the common drain, as shown on the accompanying plan. This connection did not appear on their plan. (1) Do you know of any ruling on this point? (I may add that during the execution of the work the wall of No. 16 marked A has settled slightly; No. 16 being at the lower end of the drain, the trench at this point was 6 ft. to 8 ft. deep, and about 3 ft. from the wall. The ceilings of the rooms adjoining this wall have all cracked, and also the plaster at the junction of the partition wall on either side, and both upstairs and down.) (2) Is it possible to obtain compensation from the local authority?"

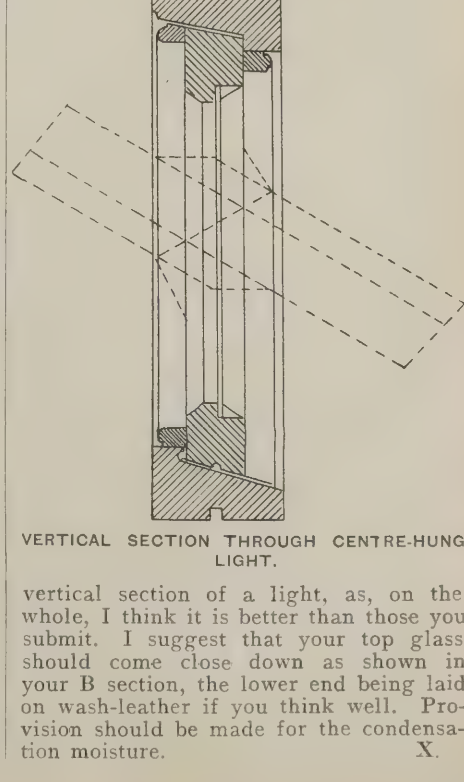
(1) I think there can be no legal doubt that the portion from the main sewer as far up as the connection of the drains from No. 18 is a sewer, and, therefore, must be repaired by the sanitary authority; above that point the case is not so clear, but I am inclined to think it to be purely a drain, and so to be repaired by the owner himself. The latest literature of which I am aware on this highly debatable subject of "drain or sewer" is contained in the Surveyors' Institution's "Transactions" for 1906-7 (vol. 39, part 11, etc.). A great many cases are there cited, and if you have access to a copy of those Transactions I am sure you will do well to consult the paper referred to. (2) Unless you are able to prove negligence upon the part of the sanitary authority, or their contractor, I am of opinion that no compensation can be recovered for accidental damages accruing by reason of the exercise of their statutory powers.

F.S.I.

Section for Lantern Light.

R.G. writes:—"I send two sections, A and B, for a lantern light (not reproduced). Kindly give your opinion on same. I shall be glad also to have a section which is thoroughly proof against rain when placed in an exposed position."

Of your two sections, B is much to be preferred, though you have made no provision for the insertion of a water-bar under the sill. I give an alternative



VERTICAL SECTION THROUGH CENTRE-HUNG LIGHT.

vertical section of a light, as, on the whole, I think it is better than those you submit. I suggest that your top glass should come close down as shown in your B section, the lower end being laid on wash-leather if you think well. Provision should be made for the condensation moisture.

X.

Cost of Flint Walls.

London.—Flint-face writes: "I want to make an estimate for a dwarf wall built of flints in lime mortar with knapped flint facing one side (the back being rough). I can find nothing in the price-books to guide me. The flints should be cheap, as the work is to be done in the cement-making district of Kent. Please give a price, with details of how it is arrived at."

In the chalk district of Sussex (flints costing nothing) I have found that flint walls can be built for approximately the same price as brick walls, including material as well as labour. You will require about 1 ton of flints to every 5 yards super. of knapped work, and you will probably be able to purchase good building flints for 6s. to 8s. per ton. X.

House Fixtures.

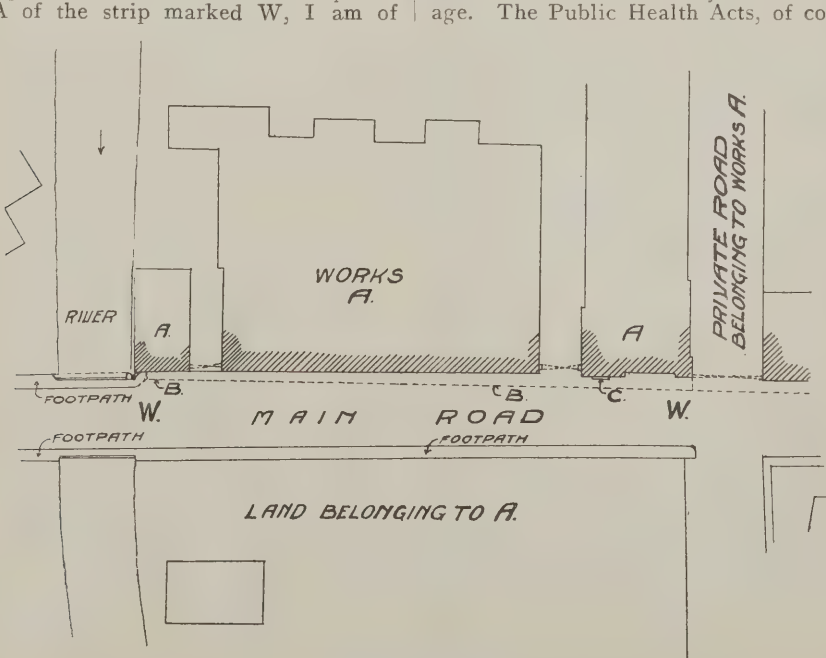
Burnley.—R.B. writes: "Please inform me whether a tenant who pays for a cupboard fixing in a house on commencing tenancy may remove it when he leaves."

Presuming that the tenant supplied the cupboard, as well as fixed it, he is clearly within his legal rights in removing it at any time before the expiration of his tenancy, but he must make good any damage that may have been done to the premises in the process of fixing or of removing his property. F.S.I.

Land Enclosure.

Oldham.—F.T. writes: "Referring to the sketch below, I shall be glad to know whether or not the owner of works, etc. marked A has legal power to erect on the boundary line, marked B, a stone curbing and iron railing, or a curb and footpath. Also, whether a step to door, marked C, would be allowed to project on land between building and boundary. In other words, can the land marked W be enclosed? The land has been paved and drained (quite apart from district council) for forty years past."

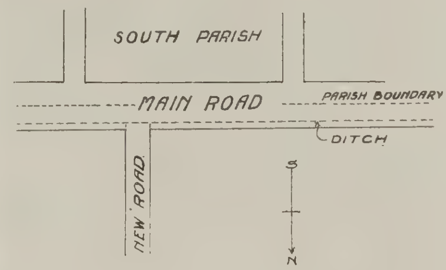
For several reasons I consider it to be extremely doubtful whether A can enclose the roadside strip marked W on plan, nor do I think he can legally project the step marked C. In the latter case, however, the urban council might reasonably refrain from raising any objection. Apart from any question of dedication to the public by A of the strip marked W, I am of opinion that the urban council would be justified in objecting to the projection of any building or fence-wall in front of the present main wall of A's works, under section 3 of the Public Health Act, 1888. F.S.I.



LAND ENCLOSURE.

Sewers and Surface Water.

Cambridge.—Boxwood writes: "An estate (see sketch) is in course of development. It is bounded on the south by a main road, along the centre of which runs the boundary between two parishes, which may be called north parish and south



parish. North parish is fairly well built upon, and has sewers and surface-water drains; the authorities are not very ready, however, to give south parish facilities for connecting to the sewers, even at a price, *i.e.*, on payment of a sewerage rate. After considerable delay the sewer in 'new road' has been connected to the north parish system. Now it is required to connect the surface-water drain to the nearest point in that of the north parish system. What powers have the owners of the estate to insist on connecting? In the alternative, can any objection be raised to turning the surface water from 'new road' (or future roads) into a biggish ditch which forms the south boundary of and belongs to the estate? Surface water from main road now runs into this ditch, and presumably has done so for many years, as it is a very old road; this, of course, is usual in country districts. I believe the two parishes mentioned form part of the same rural district."

The Rural District Council is the sanitary authority in its district, and the fact that two parishes are involved makes no difference whatever to its powers, nor to the rights of any owner to connect his drainage with the local system of sewerage. The Public Health Acts, of course, control the circumstances under which an owner may connect with the foul water sewers, but as it appears that no storm water drainage system has been installed here, there can be no possible objection to the delivery of the surface water into the ditch you mention. After all, the proposal is merely to turn into the ditch the water which would reach it in the natural way. F.S.I.

Design for Drainage System.

Reading. — B.S. writes: "I should be glad if you would give me particulars and some sketches of a system of drainage with septic tank and bed. The drainage would have to take, say, three w.c.'s, bath, and three sinks. I send rough sketch of land and would like sketch of the brick tank, and positions of inlets and outlets, size and depth of bed, etc."

You ask too much of us; we do not undertake to design entire schemes for readers, but to furnish replies on points of practice or study met with in everyday work. We would refer you to books on the subject, and to firms dealing with it.

Dampness in Buildings.

London. — J.H.S. writes: "I believe you have published some very good articles on the prevention and cure of dampness in houses. Kindly let me know the issues in which the matter appeared."

We have not published any articles on the subject, but numerous replies have appeared in our "Enquiries Answered" columns within the last few years. We would refer you to these. You will find them all indexed.

Law Case.

A Case in Respect of Footings.—At the Conway Petty Sessions on January 6th Mr. Arthur Hill, builder, was charged with a breach of by-law 15, which provides that every person who shall erect a new building shall so construct it that the walls rest upon proper footings. It was contended on behalf of the Corporation that Mr. Hill commenced to build houses and shops at Deganwy in October last, and submitted plans showing that proper footings would be put in, though, as a matter of fact, they were omitted. A correspondence took place between the borough surveyor and Mr. Hill, in which the latter was warned that footings must be provided, whatever the foundations. For the defence it was argued that the only reason for the provision of footings was to prevent subsidence, but in this case the building was practically erected on a solid rock, and how could such a building subside? The Bench were not bound to enforce a by-law in a case where its application would be unreasonable. Mr. A. Hewitt, architect, Llandudno, called as an expert witness for the defence, stated that the concrete with which the site had been levelled in places would become as hard as the rock itself. On such a foundation footings were unnecessary. In his opinion there was absolutely no risk of subsidence. The Bench considered the case to be a bad one, and they imposed on the defendant the full penalty of £5 with costs.

London Fires in 1907.—During the past year the London Fire Brigade received 4,250 fire calls. The death roll was a heavy one, about 110 lives having been lost, mostly at small outbreaks.

FIRE-RESISTING CONSTRUCTION SECTION.

(MONTHLY).

SAFETY EXITS.

A Criticism.

At last week's meeting of the Royal Institute of British Architects a paper on "Safety Exits for Theatres and other Places of Entertainment" was read by Mr. S. Hurst Seager, of Christchurch, N.Z.

We print below an abstract of Mr. Seager's paper, so that his views may be presented, but we thoroughly disagree with his strictures regarding the L.C.C. regulations and the safety of the new theatres of the metropolis, and we can find nothing new in any of his proposals, which, if summarised, are to the effect that exits should be of even width throughout, that the width should be maintained, that the wall surfaces should be smooth, that the corners of the building should be rounded and that exits should also be used as entrances, or that exits should be unimpeded.

Anyone conversant with the literature that followed the fires of the Ring Theatre of Vienna will have seen these proposals over and over again, made about a quarter of a century ago.

Mr. Seager's statements as to theatre exits may of course have some bearing on minor theatres in provincial towns, where the subject of "exit" has not yet been accorded sufficient attention, but so far as the Metropolis is concerned, the exits in new buildings, with very few exceptions, are satisfactory and fulfil all that is required for an audience of average common-sense.

It is of course true that in many of our older theatres makeshifts have had to be applied which are by no means perfect and that the exits are not satisfactory, nor have they the equality of width or the alignment desirable, but, taken all round, even in the older theatres of the metropolis, the exits have been so improved during the last ten years (thanks mainly to the Theatres Branch of the L.C.C. Architect's Department) that there is little to complain of, and London compares favourably with most of the other capital cities of the world.

We are of course all aware of what would be *ideal* conditions of safety. We have to deal, however, with practical problems, with the value of ground, and the value of bricks and mortar, and we also have to consider the comfort as well as the safety of the theatre-goers, in which connection Mr. Seager's suggested alleys lined with iron plate appear ridiculous.

There are many other matters affecting theatre safety, such as the fireproofing of scenery, etc., to which the author might devote his energies with far more serviceable results than the one he has selected.

Mr. Seager said that the subject of the safe egress from public buildings was one of such paramount importance that he had very readily accepted the opportunity offered him of placing before members for their consideration and criticism a method he had designed for preventing crushing at exits. He had the more confidence in doing this as the method had already been carried out at some of the exits in two New Zealand theatres, with the result that the audience were able to leave that portion of the auditorium to which the method was applied much more freely and quickly than under the ordinary arrangements.

Such slaves were we to precedent that building after building was constructed in which were to be seen all the faults in the forming of exits which had led to such heart-rending fatalities in the past. To effect any improvements it was principles, not precedents, which must be carefully studied, understood, and followed. No greater error could be committed than to regard the London County Council Regulations as all that was required to be followed in order to make places of entertainment safe in times of panic, or even as convenient as possible on ordinary occasions. They merely stated a minimum number and a minimum width of openings; they made no attempt whatever to show how these should be constructed, except in the case of stairs, which he should show was the form which in times of panic would be more likely to lead to disaster than many others. The mode of construction of exits was of infinitely greater importance than their number and widths. Many places of amusement, lecture-halls, and places of worship, though fulfilling the requirements of the Council, would prove to be veritable death-traps in times of panic; a very large proportion of the audience would never be able to reach the exits at all, and a great many more would either be crushed in them or in the corridors or stairs leading to them, and this because the elementary principles which should govern their construction had been ignored. Mr. Seager went on to refer to a dictum of a writer on theatre planning that long straight passages were objectionable, because "a long straight passage, and more a long straight stair, was open to the danger of accumulated pressure." It could be very simply demonstrated, however, that in a straight passage — properly designed — whatever its length there could not possibly be any pressure at all, provided the sides were perfectly smooth and that the passage was of equal width throughout. Moreover, accumulated pressure was not dependent upon the length of a passage at all, but only on its width.

The author's "safety exit," of which a plan was shown, had for its aim the eliminating of all the resistance to outward progress by means of curved solid dwarf partitions, which should be shoulder high, or about 4ft. 6ins. They might be constructed of double plates of sheet iron; it was essential that they should be permanently and strongly fixed, and be perfectly smooth. A diagram exhibited showed the method of application to an already existing exit. It showed that the exit—if wide enough—would be divided into three parts, the outer ones equal in width to the gangways at the ends of the seats, and the central one proportionate to the number of people using it. By the use of this simple device any pushing would not create pressure at the exit, but would only tend to hurry the audience more quickly into the street or corridor. Various other models and diagrams were shown in order to demonstrate the author's plans.

Mr. Seager said the effectiveness of any exit depended solely upon the number of people who could pass through it in a given time; but this appeared to have been wholly disregarded in the greater number of instances both in England and elsewhere, or the rule would never have been laid down, and apparently generally accepted, that "corridors shall have a minimum width of 4ft. 6ins. if for the use of not more than 400 persons; shall be 5ft. if for the use of 500 persons; and shall increase in width at the rate of 6ins. for each additoinal 100 persons." These widths, he contended, were based on a fallacious principle.

The author was of opinion that though the new regulations of 1906 demanded infinitely greater security than those which had hitherto been in force, they might still be improved in several important particulars. The retention of 5ft. width, although not presenting so serious an element of danger as the 4ft. 6ins., must be regarded as an oversight when one reflected how easily possible it was for three people above the average, or three men of average stature, to block it by forming a segmental arch across it.

In conclusion the following points were put forward as showing the direction in which the London County Council Regulations should be amended: —

The exits should be based on a unit measurement corresponding with the average width of adults.

All exits should be of even width throughout.

If any increase were made in the width on the line of egress that width should be maintained to the street.

The walls of all corridors should be perfectly smooth to a height of 5ft.

Every change of direction in the exit should be made by means of curved non-resisting surfaces.

The exit from any part of the building should in all cases be also the entrance.

Every precaution should be taken to keep the exits unimpeded by carriages or people.

SOME MISAPPREHENSIONS ABOUT FIRE DOORS AND THE FIRE-RESISTANCE OF WOOD.

In our last "Fire Supplement" we referred to the paper on recent fire legislation for London which Mr. William Woodward, F.R.I.B.A., read before a recent meeting of the Royal Institute of British Architects. It has been pointed out by us that Mr. Woodward in the course of his paper apparently desired to indicate that deal was of equal fire-resistance as oak, teak, or the other hard woods specified in the Building Acts as fire-resisting. Mr. Woodward was of course mistaken, as facts have long proved that, both for door work and for floor construction, hardwood such as oak, teak, jarrah or karri are immeasurably better than deal, pine, or any soft wood.

In the course of the discussion, Mr. Slater seemed to indicate that the so-called

FIRE AT THE VICTORIA WAREHOUSE, BERLIN.

armoured wood door was superior as a fire stop to an iron door. There also seems to be some misapprehension as to the actual facts here, for, given a door fitted with an equal number of fastenings (say, six fastenings), the iron door is undoubtedly far more useful. In the ordinary tin-clad armoured door the enclosed wood carbonises and the vapour created blows out the tin covering, whilst, at the most, the iron door, if properly made and fastened, becomes red hot, but remains in position.

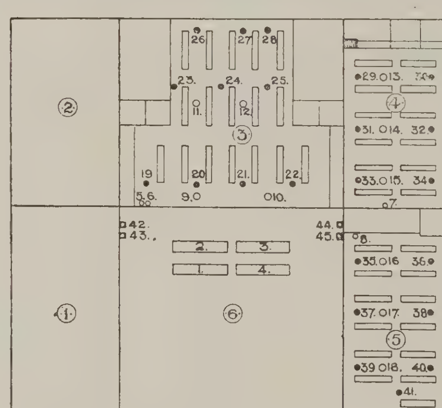
Matters of this kind are not at all questions of opinion, but of facts long proved by patient enquiry, and it is for this reason that we mention these points to prevent misapprehension.

A NOTABLE GERMAN FIRE.

Of fires in Germany the most notable one in 1907 has been that of the Victoria warehouse in Berlin. The accompanying photographs give some idea of the character of the fire risk to be found within Berlin in the warehouse district.

The fire in question is of more than ordinary interest, not only on account of its extent, but on account of the character of the contents of the building. We are here concerned with an old warehouse of old style of construction filled with highly inflammable material—forage—part of the building being used for an omnibus company's stables with 500 horses, and part of it as an omnibus garage, with about 26,400 gallons of benzine stored in the basement.

It is almost needless to say that, with the poor construction of this building, its unprotected ironwork, and the enormous amount of inflammable material, the whole block was gutted. Everything contained in the building was destroyed, with the one remarkable exception of the benzine, stored in the basement. Numerous mains were provided for drawing off this spirit, running up into the ground floor of the block, as indicated by numerals on the plan, one of the actual draw-offs being illustrated on p. 55. It is certainly a feather in the cap of those who devised the protective appliances that the benzine alone was saved.



Block plan showing benzine taps (numbered).

As regards the constructional aspect of the fire, our photographs show the usual destruction of all metal work that had not been suitably protected, and also illustrate how useless it is to put a so-called fire-resisting floor—be it of reinforced concrete or otherwise—on unprotected ironwork.

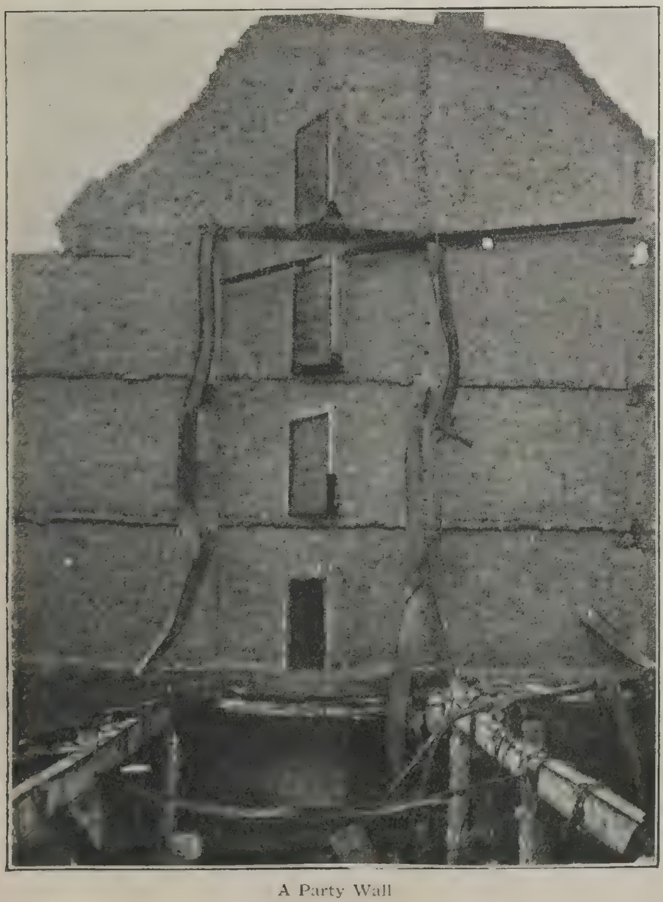
The party wall question and the question of door openings do not seem to have taught any lessons, for the majority of the doors were, we understand, open at the time of the fire.

B.F.P.C. TESTS.

Another report on fire extinguishers has been issued by the British Fire Prevention Committee: it will be dealt with in our columns on a future occasion. We understand that further tests with fire extinguishers will shortly take place, and that these will again be followed by some floor tests. Concrete and reinforced concrete seem to be occupying the Committee to a very considerable extent, and its special Commission on Concrete Aggregates is meeting frequently.

FIRE AT THE VICTORIA WAREHOUSE, BERLIN.

Views showing Effect of Fire on Unprotected Ironwork.



A Party Wall

A Benzine Tap in the Motor Omnibus Garage.

FIRE AT THE VICTORIA WAREHOUSE, EERLIN.

IMPENDING AMENDMENTS TO THE LONDON BUILDING ACT.

The L.C.C. Proposals before Parliament.

We have referred to this matter frequently, and have pointed out that while we certainly agree that the cubic extent now permissible should be extended, and that the question of horizontal divisions should be more liberally dealt with, it would be most inadvisable to give the London County Council discretionary powers in this matter without limiting the cubic extent to specific figures and inserting specific conditions in the Act.

Further, it seems somewhat extraordinary that such an important provision as that of cubic extent should be now dealt with in a London County Council "General Powers" Bill, when it has been long the ambition of all who have to deal with the Act to have a Building Act and Building Act Amendments Act, but no cross-reference to general powers or public health enactments.

We assume, however, that this new policy to embody such important provisions in a General Powers Bill is due rather to a desire of hiding the subject, and we can only trust that it will not escape the attention of the property owner and his professional representatives, who surely do not desire to see the Council sole arbiter in such matters.

The actual clauses in the Bill, as it stands at present, will be found in Part iv. of the London County Council General Powers Bill, now obtainable from Messrs. Dyson and Co., Parliamentary Agents of Great George Street, Westminster. The following is the precise text. We may have to deal more critically with these clauses on a future occasion.

The Clauses.

PART IV.—BUILDINGS.

Principal Act and this Part of Act to be construed as one Act.

27.—"The London Building Act, 1894" (in this part of this Act referred to as "the principal Act") and every existing Act amending the same and this part of this Act shall be read and construed together as one Act and words and expressions used in this part of this Act shall unless the context otherwise requires, bear the meanings assigned to them in the principal Act and any references in the principal Act or any such amending Act as aforesaid to any part or provisions of the principal Act shall be construed as referring to such part or provisions as amended by this part of this Act.

Repeal of Sections 75, 76 and 77 of principal Act.

28.—Sections 75 (cubical extent of buildings), 76 (consent to larger dimensions) and 77 (rules as to uniting buildings) of the principal Act are hereby repealed.

Cubical extent of buildings.

29.—(1) Except as in this section provided no building of the warehouse class or used for any trade or manufacture shall extend to more than two hundred and fifty thousand cubic feet unless divided by party walls in such manner that no division thereof shall extend to more than two hundred and fifty thousand cubic feet and no addition shall be made to any such building or division so that the cubical extent of such building or division shall exceed two hundred and fifty thousand cubic feet.

(2) Where the Council are satisfied on the report of the Superintending Architect and of the Chief Officer of the Fire Brigade that additional cubical extent is necessary for any such building or division as aforesaid and are satisfied that proper arrangements have been or will be made and maintained for lessening so far as reasonably practicable danger from fire the Council may consent to such building or division containing additional cubical extent, but such consent shall continue in force only while such building or division is actually used for the purposes of the trade or manufacture (if any) in respect of which the consent was granted. In giving any such consent as aforesaid the Council may, if satisfied as to construction, accept horizontal separations in the building or division in respect of which the consent is given.

(3) The provisions of this section shall not apply to any building which, being at a greater distance than two miles from St. Paul's Cathedral, is used wholly for the manufacture of the machinery and boilers of steam vessels or for a retort house or for the manufacture of gas or for generating electricity provided that such building consist of one floor only and be constructed of brick, stone, iron or other incombustible material throughout, and be not used for any purpose other than such as are specified in this sub-section and every such building shall, for the purposes of the provisions of the principal Act with respect to special buildings, be deemed a building to which the general provisions of Part VI. of the principal Act are inapplicable.

Rules as to uniting buildings.

30.—(1) Buildings shall not, without the consent of the Council, be united unless (A) they are wholly in one occupation, and (B) when so united and considered as one building they would be in conformity with the principal Act as amended by this part of this Act and with this part of this Act.

(2) An opening shall not be made in any party wall or in two external walls dividing buildings which, if taken together, would extend to more than two hundred and fifty thousand cubic feet, except under the following conditions:—

(A) Such openings shall have the floor, jambs and head formed of brick, stone, or iron, and be closed by two wrought iron doors each one-fourth of an inch thick in the panel at a distance from each other of the full thickness of the wall fitted to rebated frames without woodwork of any kind or by wrought iron sliding doors or shutters properly constructed, fitted into grooved or rebated iron frames, and all such doors, sliding doors, and shutters shall be fitted with bolts or other fastenings and be capable of being opened from either side, and shall have styles and rails at least six inches wide and shall be constructed, fitted and maintained in an efficient condition in all respects to the satisfaction of the District Surveyor. Provided that in lieu of being constructed and fitted as aforesaid, such doors, sliding doors and shutters may be constructed of such fire-resisting materials and be fitted in such manner as may be approved by the Council.

(B) Such opening shall not exceed in width seven feet, or in height eight feet, and the width of such opening, or (if more than one) of all such openings taken together, shall not exceed one-half of the length of the wall on each floor of the building in which the opening or openings occur. Provided that any such opening may be nine feet six inches in height in a wall of which the thickness is not less than twenty-four inches, or if the doors, sliding doors, or shutters closing such opening are placed at a distance of not less than twenty-four inches from each other.

Provided also that the Council may consent to any such opening being of such greater height or width as they may think fit.

(3) Whenever any buildings which have been united cease to be in one occupation the owner thereof, or if the buildings are the property of different owners, then each of such owners shall forthwith give notice to the District Surveyor, and shall cause all openings made for the purpose of uniting the same in any party wall between the buildings or in any external wall to be stopped up (unless the Council consent to such openings or any of them being retained) with brick or stone work not less than thirteen inches in thickness (except in the case of a wall eight and a half inches in thickness, in which case eight and a half inches shall be sufficient) and properly bonded with such wall and any timber placed in the wall and not in conformity with the principal Act shall be removed, and if notice be not given to the District Surveyor pursuant to this section such owner or each of such owners shall, upon conviction, in a summary manner, be liable to a penalty not exceeding five pounds.

(4) Buildings shall be deemed to be united when any opening is made in the party wall, or the external walls dividing such buildings, or when

FIRE AT VICTORIA WAREHOUSE, BERLIN: A CONCRETE FLOOR SUPPORTED BY UNPROTECTED IRONWORK.

such buildings are so connected that there is access from one building to the other without passing into the open air.

Penalty for failure to comply with conditions.

31.—Any person failing to comply with any term or condition imposed by the Council in giving any consent under this part of this Act shall be liable to a penalty not exceeding twenty pounds and to a daily penalty not exceeding the like amount.

THE BUILDING ACT COMMITTEE'S STATEMENT.

The application of the amendments of the Building Act still seems to be so little understood that we welcome a return on the general requirements in respect of the provision of means of escape in case of fire, recently issued by the London County Council. We publish the Building Act Committee's statement in full, for not only does it form interesting reading in itself, but it presents in a clear and concise manner the position at the moment of the London County Council's powers in this matter, and what we print below should certainly be kept for reference purposes by all architects in the metropolis.

We have nothing to say against the issue of the statement, but would take this opportunity to point out again that we do not consider the Council has pushed forward, as energetically as it should, the numerous improvements which it is empowered to command where the safety of life from fire is concerned, and that, in particular, projecting shops should have their most immediate attention. There can be no doubt that hundreds of such shops have been reported upon by the London district surveyors, and that many of them are of a most dangerous character. It would indeed be regrettable if it were necessary to have another Victoria Street warehouse or an Edgware Road projecting shop fire to put the Amendment Act fully into operation. We should have thought preventative activity would have been in place now that the powers have been obtained for almost two years, and have all been in force since the beginning of 1907.

The Statement.

Statement of general requirements in respect of the provision of means of escape in case of fire under the Factory and Workshop Act, 1901, and London Building Acts (Amendment) Act, 1905.

High buildings and twenty person buildings.—By the provisions of sections 7 and 9 of the London Building Acts (Amendment) Act, 1905, the duty is imposed upon the London County Council of ensuring that the following buildings shall be provided with such means of escape in case of fire as can be reasonably required in the circumstances of the case:—

(*a*) Any high building, i.e., a building having any storey the level of the upper surface of the floor whereof is at a greater height than 50 ft. above the level of the footway (if any) immediately in front of the centre of the face of the building in which such storey is situate, or, where there is no such footway, above the level of the ground before excavation.

(*b*) Any building in which sleeping accommodation is provided for more than twenty persons, or which is occupied by more than twenty persons, or in which more than twenty persons are employed, or any new building which is constructed or adapted to be occupied by more than twenty persons, or which is constructed or adapted for the employment therein of more than twenty persons.

Note.—Dwelling-houses occupied as such by not more than one family are exempt from the provisions of sections 7 and 9.

Projecting shops.—By the provisions of section 10, in every new and existing building in which any persons are employed or sleep, part of which is used or adapted to be used as a shop and projects 7 ft. or more beyond the main front of such building, the roofs over the projecting portions are required to be constructed of fire-resisting materials not less than 5 in. thick. Provisions are also made with regard to the position and construction of lantern lights and ventilating cowls in such roofs.

Rooms over premises used for storage of inflammable liquid.—By the provisions of section 11, buildings used in part for storage of inflammable liquid and in part for living rooms, etc., are required to be provided with—

(1) Adequate safeguards to prevent the spread of fire from the part of the building used for the storage of any such inflammable liquid to any room used as a living room, workshop or workroom constructed over or communicating directly with any part used for the storage of such inflammable liquid, and

(2) Means of ready escape from such room in case of fire.

Means of access to roofs.—By the provisions of section 12 every existing building having a shop projecting 7 ft. or more from the main front of the building and to which section 10 above referred to applies, and every other existing building, except a dwelling-house occupied as such by not more than two families, and every new building shall, if having more than two storeys above the ground storey or if exceeding 30 ft. in height, be provided (unless and except so far as the Council shall otherwise allow) with a dormer window or a door opening in a suitable position on to the roof or a trap door in a suitable position with a fixed or hinged step ladder or other proper means of access to the roof as specified in such section 12, and with a sufficient parapet or guard rail where reasonably practicable and necessary to prevent persons slipping off the roof. The provisions of such section do not apply to buildings falling within either sections 7 or 9 abovementioned.

Conversion of buildings.—Under the provisions of section 13, buildings shall not, without the consent of the Council, be converted, whether by change of user involving structural alterations or not, in such a manner that the buildings when so converted will not be in conformity with the Act.

Means of escape to be maintained.—Under the provisions of section 14, all means of escape provided under this Act or otherwise shall be kept and maintained by the owner of the building in good condition, and repair, and efficient working order, and no person shall obstruct or render less commodious, or permit or suffer to be obstructed or rendered less commodious any such means of escape.

Exemption of certain buildings.—Certain buildings are specially exempted from the operations of the Act (sections 28 to 42), and there is also a proviso (section 26) that the provisions of the Act shall not apply to any building the whole of which is a factory or workshop within the meaning of section 14 of the Factory and Workshop Act, 1901, or to any common lodging-house within the meaning of any statute for the time being in force relating to common lodging-houses within London.

Right of appeal under certain conditions.—Under certain defined conditions the owner of an existing or new building has a right of appeal to the Tribunal of Appeal against the decision of the Council.

Factory and Workshop Act, 1901.

Factories and workshops.—The provisions of sections 14 and 103 (1) (*d*) of the Factory and Workshop Act, 1901, require that each factory, workshop or laundry, in which more than 40 persons are employed, shall be provided with such means of escape in case of fire for the persons employed therein, as can reasonably be required in the circumstances of each case.

Arbitration in the event of a difference between owner and Council.—In case of a difference of opinion between the owner of an existing factory or workshop and the Council under section 14, there is a provision in the Act for arbitration, but this does not apply to new factories or workshops.

Statement of General Requirements.

The following statement with reference to the requirements in respect of the means of escape in case of fire to be provided in accordance with the provisions of the before-mentioned Acts has been drawn up with a view to assisting owners and others in submitting applications and proposals to the Council thereunder. *This statement must not, however, be taken as binding upon the Council, but only as a general guide or indication, since each case is, after full consideration of the varying circumstances, dealt with on its merits; and nothing herein contained must be taken as in any way interfering with or derogating from the powers of the Home Office, the Council, the District Surveyors or any other authority whatsoever under the Factory Act, the London Building Acts or any other Act, or under any by-laws that may be made under section 15 and Section 153, sub-section 3, of the Factory and Workshop Act,* 1901, *or under any by-laws or regulations relating to the construction of buildings or otherwise, or as constituting any consent, sanction, allowance or permision under any such Act, by-law or regulation, but all such Acts, by-laws and regulations must be fully observed and complied with notwithstanding anything herein contained.*

Applications.

Particulars required.—Applications for the Council's certificate in respect of the means of escape from new buildings, and applications with proposals to meet the Council's requirements in respect of the means of escape from existing buildings or for exemptions from any of the provisions of the above Acts should state—

(a) The Act and section of the Act under which application is made.

(*b*) The number of persons for whom sleeping accommodation is provided and the number of persons occupying or employed on or intended to be occupied or employed on the various floors of the premises, specifying approximately the numbers of males and of females.

(*c*) The trade, if any, carried on or to be carried on on each floor, with particulars of machinery, power, etc.

(*d*) In the case of existing buildings, the date of the erection of the building.

(*e*) The name and address of the owner and the occupier (if any).

(*f*) Particulars of the occupation or proposed occupation of the building. If in different occupations, particulars with regard to each part should be furnished.

Plans required.—Applications should be accompanied by all necessary plans, sections and elevations, drawn to one-eighth inch or one-quarter inch scale (one-eighth preferred), and by a block plan to a small scale showing the premises and the surrounding buildings and thoroughfares, such block plan having the north point indicated. These plans should show (as far as may be necessary for the purpose of the application) the means of escape proposed to be provided.

Means of Escape.

Number of staircases.—The means of escape required depend, *inter alia,* upon the following circumstances—

(*a*) The area and disposition of the building.

(*b*) The number and the distribution of the persons for whom the means of escape are to be provided.

(*c*) The user of the building.

(*d*) The nature of the building.

(*e*) In the case of a building used for trade purposes the nature of the materials and goods stored or manufactured in the building.

(*f*) The provision of an efficient system of automatic fire alarms, sprinklers or other appliances.

Means of escape.—It may, however, be laid down as a general principle (subject to the exceptions hereinafter mentioned) that at least one enclosed and protected staircase and exit will be required, and in addition an alternative means of escape from each floor by one of the following means:—

(*a*) Another enclosed and protected staircase and exit in the same building.

(*b*) A suitable staircase in another block, to which access is given by doorway openings in the party or division walls, or by external communication.

(c) External gangways or balconies affording access to adjoining or adjacent buildings.

(*d*) An external iron staircase.

(*e*) Any other suitable arrangement which will, in the opinion of the Council, secure the desired object having regard to the circumstances of any particular case. No arrangement which is not permanently fixed in position or which requires manipulation in part or in whole in order that it may be used in case of emergency can be accepted.

Position.—Where there are two or more means of escape from any floor, they should be placed as far as practicable from each other so as to be approached from any part of the floor area independently of any one fire risk on that floor.

Escape by roof.—(*f*) In all cases where considered necessary by the Council some means of escape from the roof of the building to the roof of the adjoining premises should be provided.

Cases in which one staircase may be deemed sufficient.—(*g*) In small premises, and in some cases where it is possible to provide a staircase in a central position, one enclosed staircase, may be accepted provided that the premises are not used for the storage or manufacture of inflammable or explosive materials.

Maintenance.

Periodical examination should be made of all means of escape provided to ascertain whether they are in good condition and repair and in efficient working order.

All persons who are employed in or who occupy buildings in which means of escape have been provided should be made acquainted with the position and nature of such means of escape.

In hotels, boarding-houses, etc., notices should be displayed in each bedroom giving information as to the position and nature of the means of escape in case of fire, and the corridors, staircases and exits should be sufficiently lighted during the night.

DETAILS OF THE CONSTRUCTION, ETC., OF MEANS OF ESCAPE.

I.—Enclosed and Protected Staircases.

A.—*Internal incombustible staircases.*

Enclosure.—(*a*) The staircases, including landings, lobbies and passages from one flight to another shall be enclosed by walls, not less than 9 inches thick, the outer edges of the steps and landings being properly supported.

(*b*) The staircases shall be ceiled with iron and concrete where they are not carried up above the roof, or where they are carried up above the roof and are liable to attack by fire from an adjoining structure.

Materials to be used.—(*c*) The staircases, including the flooring in the lobbies, approach passageways, etc., shall be constructed of incombustible materials with solid square or spandril steps, which should be supported at both ends on brickwork. The steps and landings shall be not less than 6 inches thick.

(*d*) Spandril steps where used shall be of the following thickness—

(i) For staircases 3 feet 6 inches wide, not less than 3 inches thick in the smallest part.

(ii) For staircases 4 feet 6 inches wide, not less than $4\frac{1}{2}$ inches thick in the smallest part.

B.—Internal fire-resisting staircases.

Materials to be used and enclosure.—(*a*) The staircases, including the treads, strings, carriages, landings, joists and floors, should be constructed of oak, teak, jarrah, karri or other hard timber of not less than $1\frac{3}{4}$in. finished thickness (no fir or pine must be used), and the enclosure to the staircase should be a solid partition of incombustible fire-resisting material at least 3ins. thick, carried up through the thickness of the floors.

(*b*) The ceilings and soffits of the staircases and landings, if any, should be of plaster or cement.

(*c*) A suitable balustrade should be provided where necessary to the outer string of the staircases.

II.—External iron staircases.

(*a*) The staircases, including the strings, bearers, and supports, should be of iron, and constructed throughout upon dead bearings, to the satisfaction of the district surveyor.

(*b*) The steps and landings should be constructed of solid or perforated iron plates (if perforated plates be used no perforation should exceed three quarters of an inch across each way).

(*c*) The risers should be of iron either solid or of a close pattern.

(*d*) Where an iron staircase is in general use the treads and landings should be finished with a surface of approved non-slippery material as distinguished from perforated iron or chequered iron plates.

(*e*) All windows and similar openings by or near any such staircase should be glazed with fire-resisting glazing, and where necessary the sashes and frames should be fixed.

(*f*) A balustrade of a close pattern at a suitable height should be provided on each side of the flights and round the landings. If balusters be used they should be not more than 6 inches apart.

(*g*) The staircases should deliver into the outer air, at the ground level, into a public way or thoroughfare, or some large open space.

III.—Generally as to staircases.

Position.—(*a*) Internal staircases should, where practicable, be placed next to an outer wall, and be so arranged that persons enter them from any floor level in the direction of descent.

Lighting and ventilation.—(*b*) Internal staircases should be properly lighted and ventilated by windows, or, in exceptional cases, other effective means.

Treads and risers- (*c*) The treads of the staircases should be not less than 10 ins. wide clear of nosings, and the risers not more than $7\frac{1}{2}$ ins. wide.

Handrails.—(*d*) Staircases should be provided with handrails fixed upon both sides thereof, and continued round the landings and chased into the end of newel walls where these occur.

Width of staircases, etc.—(*e*) Where the doorways or staircases may be used as means of escape by not more than 200 persons, they should not be less than 3 ft. 6 ins. wide.

(*f*) Where the doorways or staircases may be used as means of escape by more than 200 persons or by more than 100 persons on any one floor, they should be not less than 4 ft. 6 inches wide.

Doorways to staircases.—(*g*) The doorways for access to and exit from the staircases should in all cases be of the width in the clear mentioned above when the doors are open.

(*h*) All doorways leading to staircases should, where necessary, be recessed. The recesses should be constructed throughout of fire-resisting materials, and be fitted with doors of fire-resisting materials (oak, teak, jarrah, karri or other hard timber of not less than $1\frac{3}{4}$ ins. finished thickness) in two folds hung so as to open in the direction of exit, or to swing both ways clear of steps, landings, passageways, and footways. Such doors must be fitted with springs, weights or other approved appliances to close them after use.

The frames of the doors shall be bedded solid to the walls or partitions.

Steps, flights, and landings.—(*i*) Staircases should be arranged in straight flights, without winders; each flight should consist of not more than fifteen steps; landings should be provided at the top and bottom of each flight; the steps and landings should be of the full width of the staircases.

Landing spaces.—(*j*) Landing spaces not less than 2 ft. 6 ins. wide should be provided between the steps of the flights and the escape doorways leading to and from the staircases.

Supports and enclosures.—(*k*) All supports to internal fire-resisting staircases and their enclosures should be of fire-resisting materials, and all ironwork supporting internal staircases and their enclosures should be protected by plastering or other incombustible or non-conducting external coating not less than 2 ins. in thickness.

Doors affording access to roof.—(*l*) Doors at the head of staircases affording access to the roof should be glazed in the upper panels with ordinary glass.

IV.—External iron gangways and balconies.

Materials to be used.—(*a*) These gangways and balconies should be supported on dead bearings and be provided with solid floors of incombustible materials; if perforated iron flooring be used the perforations should not exceed three-quarters of an inch across each way.

Balustrades.—(*b*) A suitable balustrade not less than 3 ft. 6 ins. high should be provided to these gangways and balconies.

V.—Enclosure and position of lifts.

In cases where a lift will, in the opinion of the Council, endanger the means of escape, the following requirements should be observed—

Position.—(*a*) Lifts, excepting passenger lifts constructed within the open wells of staircases and enclosed only with metal grilles, should not be placed near to escape staircases and shall not be connected directly therewith by means of openings or otherwise.

Enclosure.—(*b*) In buildings where fire-resisting floors are provided, lifts should be enclosed all up with incombustible materials and fire-resisting doors or shutters. When the shaft of the lift is carried up to the roof it should be continued through the roof, and, if covered, thin glass should be used, protected on the outside with strong wire guards.

(*c*) In other buildings where there are large floors undivided by partitions, fixtures, etc., lifts if placed as far as practicable from the staircases, exits, etc., may be enclosed with fire-resisting materials to a height of 4 feet above each floor level, and above this with stout wiremesh guard.

VI.—Buildings used for the storage of inflammable liquid.

(*a*) Rooms in which inflammable liquid is stored should be separated from other parts of the building by brick walls and fire-resisting floors and ceilings.

(*b*) Doorways for access to such rooms should be fitted with self-closing, fire-resisting or iron doors.

(*c*) Adequate ventilation should be provided.

(*d*) Living rooms, workshops or workrooms constructed over or communicating directly with any part of a building used for the storage of inflammable liquid should be provided with exit doorways giving access to some safe position as far as practicable from the storage, and with doors hung to open in the direction of exit with only such fastenings as can be easily and immediately opened from the inside.

VII.—General.

Guard rails.—(*a*) Proper guard rails should be provided to the routes of escape on roofs, etc., and round skylights, lantern lights and ventilating cowls on the roofs of the projecting shops.

Gangways.—(*b*) Clear gangways should be kept up to and between all staircases, gangways and exits on all floors.

Escape doors.—(*c*) All escape doors should be made so as to open in the direction of exit or to swing both ways, clear of steps, landings, passageways, etc.

(*d*) All doors usable as means of escape from both sides should swing both ways and be kept free from all fastenings.

(*e*) All such doors must, if required to be provided with fastenings during the time persons are upon the premises, be fitted during such time with automatic bolts only.

(*f*) In buildings other than residential buildings a portion of the upper panels of all fire-resisting doors usable as means of escape should be glazed with transparent fire-resisting glazing, and it is suggested that a portion of the upper panels of all other principal exit doors should be glazed with clear glass, the glass to be at such a height as will enable persons approaching the doors in opposite directions to see each other.

Windows to Open.—(g) Windows on the floors above the ground facing the public way, street, thoroughfare or open space should be made to open easily at sill level to a sufficient height and width to allow a full grown person to pass through in case of need.

Windows and doors.—(*h*) Windows and doors affording access to external escape staircases, balconies, bridges, etc., should be marked on the inside in large letters "exit in case of fire."

Theatres, Music Halls, Concert Halls, etc.

Premises to be used for music, dancing, stage plays or entertainments of a like kind are specially dealt with under the Metropolis Management and Building Acts (Amendment) Act, 1878, and the Metropolitan Board of Works (Various Powers) Act, 1882, and special regulations relating to such premises have been made by the Council.

ELECTRICITY AS A FIRE RISK.

At a recent meeting of the Insurance and Actuarian Society of Glasgow Mr. R. C. Fulton brought forward a paper entitled "Electricity—Where the Risk comes in," in the course of which he pointed out that in his opinion a good many of the fires due to electricity in Glasgow were caused by the arcing from live tubing on to gaspipes. Among suggested remedies he emphasised periodical inspection as being advisable. There is no doubt that this is a matter of considerable importance. Inspection would be especially useful in cases where electric light has been installed for a number of years, as sometimes the early installations are anything but satisfactory; this applies especially to large works and shops, where the wires pass through damp cellars.

NOTES ON FIRE PROTECTION.

By Edwin O. Sachs, F.R.S. (Edin.), etc.

The term "Fire Protection" is too often misunderstood. Fire-extinguishing — in other words, fire-brigade work—is what the majority have in their mind, and many towns consider themselves well protected if they can boast of an efficiently-manned fire-engine establishment. In reality, the fire brigade as such has but a minor rôle in a rational system of protection. Really well protected towns owe their position, in the first place, to properly-applied preventive legislation, based on the practical experience and research of architects, engineers, and fire chiefs, insurance and municipal officials.

Fire protection is a *combination* of *fire prevention* and *fire combating*.

Fire Prevention.

Preventative measures may be the result of private initiative, but as a rule they are defined by the local authority, and contained partly in Building Acts and partly in separate codes of fire-survey regulations, supplemented, if necessary, by special rules as to the treatment of extraordinary risks, such as the storage of petroleum, the manufacture of explosives, and the performance of plays.

Education of the Public.

The education of the public in the direction of fire prevention is a factor of importance, and this can be quite informally commenced at school and continued by official and semi-official warnings, and a judicious arrangement with the ever-powerful Press as to the tendency of their fire reports.

Fables should be included in the "Standard Reader," which warn children not to play with matches and teach them to run for help in case of an emergency. Instructive copy-book headings have been arranged in place of the meaningless sentences so often used in elementary schools. There are quite a number of municipalities where regular warnings are issued (to take an instance again) every December as to the dangerous Christmas-tree, and there are cities, such as the Metropolis, where the fire brigade issue suitable cards with "hints" as to what is best done, the cards being obtainable at 1d. each. These hints were proposed by Captain Hamilton, R.N., and are published under the auspices of the L.C.C. In some places every inhabitant has at least an opportunity of learning how to throw a bucket of water properly, and the neatest way to deal with a burning person. The householder is officially informed where the nearest fire-call point is, and how long he must expect to wait till the first engine can reach his house. If he is a newspaper reader he will also have ample opportunity of knowing the resources of his town, and the local reporter's semi-official or censored fire report will give him much useful information based on facts supplied by the authorities.

Fire Combating.

"Fire Combating" includes both self-help and outside-help.

Self-help mainly concerns the protection of large risks, such as factories, stores, public places of amusement, where it lends itself to regulation. The requirements of the fire survey code may allow for hydrants or sprinklers in certain risks and also for their regular inspection, and the means for self-help may thus be given. These means will, however, probably not

be properly employed unless some of the employees engaged on the risk are instructed as to their purpose and have confidence in the apparatus at their disposal. The possibility of proper self-help in dangerous risks may be encouraged by enforcing regular drills for the employees and regular inspections to test their efficiency. There are towns where great reliance is placed on the efforts of such amateur firemen. In some cities they even receive extra pay, and are formed into units, properly uniformed and equipped, and retained by the fire brigade as a reserve force for emergencies. In our Metropolis there are quite a number of private fire brigades belonging to factories, warehouses, large shops, etc., and there is an association which encourages these brigades to excel in competitions, there being an annual championship under civic patronage at the Guildhall.

Self-help for the shopkeeper, the lodger, or the householder can scarcely be regulated. Self-help in small risks may, however, be distinctly encouraged by the authorities without any irksome interference with personal liberty, simply by the provision of street pillar-boxes, with the necessaries of first aid, including perhaps a couple of scaling ladders, and, further, by opportunities being given to householders to learn how to handle them. Put a street pillar-box of this kind in a fire station, reserve certain afternoons in the year on which this elementary instruction will be given, and the novices afterwards shown over the fire station or treated to a "turn-out," and there will be quite a number taking advantage of the occasion. No matter whether curiosity or real interest brings theme there, the object in view will be attained.

When speaking of outside help, this means organised outside help, and not simply such as is tendered by the casual passer-by or by a neighbour. The link between self-help and outside help is

The "Fire Call."

The efficiency of the fire-call depends not only on the instrument employed and its position, but also on its conspicuous appearance and the indications given to find its whereabouts. These indications are quite as important as the instruments themselves. The conspicuousness of the instrument alone does not suffice. Official notifications should be given in the Press from time to time in regard to the position of the call-points. An indication at every street-corner as to the direction to take to reach the point—or, perhaps better, the conspicuous advertisement of the nearest call-point over every post pillar-box—may enable the veriest stranger to call assistance and minimise the chances of time being lost in search of the instrument.

It is immaterial for the moment if the helpers are called by a bell outside a fire station, by a messenger from some special messenger service, a call through a telephone, or an electric call-point or automatic appliance. Any system or instrument will do that ensures the call being transmitted with maximum speed and certainty, and in full accord with the requirements of the locality.

As to organised outside help, it may not be limited simply to the attendance of the fire brigade. Special arrangements can be made for the attendance of the local police force, a public or private salvage corps, an ambulance, or, in cases, military guard. Then, in some instances, arrangements are made for the attendance of the water and gas companies' servants, and even officials from the public works' office, insurance surveyors, and the Press. In places the salvage corps arrives on the scene almost simultaneously with the fire brigade. There are places where the police are generally on the spot in good force five minutes after the arrival of the first engines. There are cities where the ambulance-waggon and the steamers almost arrive together, and others where the military authorities always send a fire piquet that is turned out in a few minutes.

Definition of Powers.

If all these helpers come together—and no matter how high the rank of the individual commanders—the senior officer of the local fire brigade, even if he holds only non-commissioned officer's rank, should have the reins, and his authority be fully recognised. Unfortunately, there are not many places where this was the case, hence it is well to note that since January 1st the responsibility of the local fire chief is specially defined by Act of Parliament throughout the country, as it has long been for the Metropolis. The efficiency of outside help depends in the first instance on clearly defining the duties and powers of all concerned —on the legal foundation, in fact; then on the organisation, the theoretically as well as practically current executive; and last, but by no means least, the prestige, the social standing, the education of commanders and their ability to handle men. For the rank and file of the brigade, clear-headedness, pluck, smartness and agility will be as invaluable as it is dangerous to have reckless dare-devilry, showy acrobatism, or an insane ambition for distinction among the members of the force. True fire-preventive and fire-combative measures can only be obtained by the aid of careful investigation, known here as "Fire Research."

Investigations and "Fire Research."

Under the heading "Fire Research" should be included all theoretical and experimental investigation as to materials and construction, combined with the chronicling of practical experience in fires, then the careful investigation and chronicling of the causes of fires, assisted where necessary by a power for holding fire inquests in interesting, suspicious, or fatal cases. It includes experimental investigation as to natural and accidental causes as distinct from criminal causes. Research in criminal cases may not only be assisted by a fire inquest as generally understood, but also by immediate informal inquiries held on the spot by the senior fire brigade and police officers present, or by immediate Government investigations held on the same lines as inquiries into explosions or railway accidents. In the City of London the coroner has the right by Act of Parliament to hold inquests on fires, even if there has been no loss of life, and a Bill has been lodged in Parliament to award similar powers to coroners throughout the country. As to general research work, there are some few cities where, of late years, experts have been regularly employed to superintend a series of experiments on the resistance of materials and systems of construction, but most of this class of work has so far been done by voluntary effort, notably in Great Britain by the British Fire Prevention Committee. Then there are the usual statistics as to outbreaks, their recurrence and causes; and in some places such tables are supplemented by reports on experiments with oil lamps, their burners and wicks, electric wiring and the like, also with reports on tests with fire appliances, etc. Bodies such as the National Fire Brigades Union do considerable service in directly or indirectly collecting data. The Home Office also from time to time issues most useful reports and statistics, whilst the Reports of the Chief Inspector of Factories and of the Chief Inspector of Explosives to the Home Secretary (published in Blue Book form) are a veritable mine of information.

To summarise: "Fire Protection" consists of "Fire Prevention," and "Fire Combating," with due regard to the results of "Fire Research." Before entering into detail, the financial aspects of such protection must be touched upon, and mainly on its relation to the public purse.

FIRE PROTECTION AND FIRE LOSSES.

Distribution of Losses.

It is well known that property destroyed by fire is practically an absolute loss. This loss may only actually affect the owner, or it may be distributed among a number of people who are taxed for it in the form of a contribution to their national or local fire fund, a share in some mutual iusurance "ring," or the more usual insurance companies' premium. In the first two cases there are also some expenses to subscribe to in connection with the management of the fund or "ring." In the latter case not only the expenses of management have to be covered, but also the costs incurred in running the the venture—namely, the agency commissions and the profit for the insurance company's shareholders.

Loss and Expenditure.

One must here distinctly discern what is a "loss" and what is mere "expenditure." The sinking fund of the large property owner should cover a loss with a minimum extra expense. Insurance in an extravagantly managed company paying large dividends will cover a loss, but with an unnecessary large extra outlay. In every case the loss remains; and as property must always be considered national, the community, the county or nation, as the case may be, suffers. It is always in the interest of a nation to minimise its national losses, no matter whether they fall on one individual's shoulders or on many, and whether such losses are good for certain trades or not. To talk of a fire being "good for trade" is absolute nonsense.

(To be continued.)

A COLLAPSIBLE FIRE-ESCAPE LADDER.

A new ladder to enable occupants of buildings to escape in case of fire has just been put on the market by Messrs. Turner and Co., Ltd., of 1 and 2, George Street, Lisson Grove, London, N.W. We illustrate it on the next page. The sides and rungs of the ladder are composed of channel iron specially rolled to a light section. The width of the rungs is less than that of the sides, so that they fit freely between the side flanges, and they are attached between these flanges by means of pivots, which allow them to move vertically, but which keep the ladder otherwise rigid. As shown by Fig 1, one of the sides of the ladder is attached to the wall and the other side is movable. Anyone desiring to use the ladder for the purpose of escape opens out this free side, by lifting up a rod within the building, which causes the ladder to drop until it rests upon the ground. It is closed by a reverse

operation. It cannot be opened out excepting from within the building, so that there is no possible risk of burglars or other undesirable persons using the ladder. The locking arrangement is very simple: at each floor or landing a handle is attached to the rod for opening or closing the ladder, and when closed these handles are just pushed underneath a pin in the wall (the rod being free to move round a quarter turn to allow this to be done). A further safeguard is provided by attaching an alarm so that when the ladder is open, ready for use, bells are set ringing on every floor. Further precautions may be taken by enclosing the handles for operating the ladder in boxes in which glass has to be broken before they can be got at. When closed the ladder is quite unobtrusive, simply appearing as a rectangular box, 1¾ins. by 2½ins., lying close against the wall. There is no difficulty in arranging the ladder to work round projections such as string-courses, cornices, etc.

The 1905 Amendment to the London Building Act has attracted a great deal of attention to this subject of means of escape in case of fire, and Parry's Patent Collapsible Fire Ladder offers many advantages that should be welcomed by architects and others. One of its greatest advantages is that it overcomes all the objections to the provision of permanent iron ladders communicating with balconies, which have been so often advocated (with very good reason).

Specimens of the ladder can be seen in use at Messrs. Turner and Co.'s works in George Street, and also at the premises of Messrs. Wm. Parton, Ltd., 94 and 95, Queen Street, Cheapside, E.C.

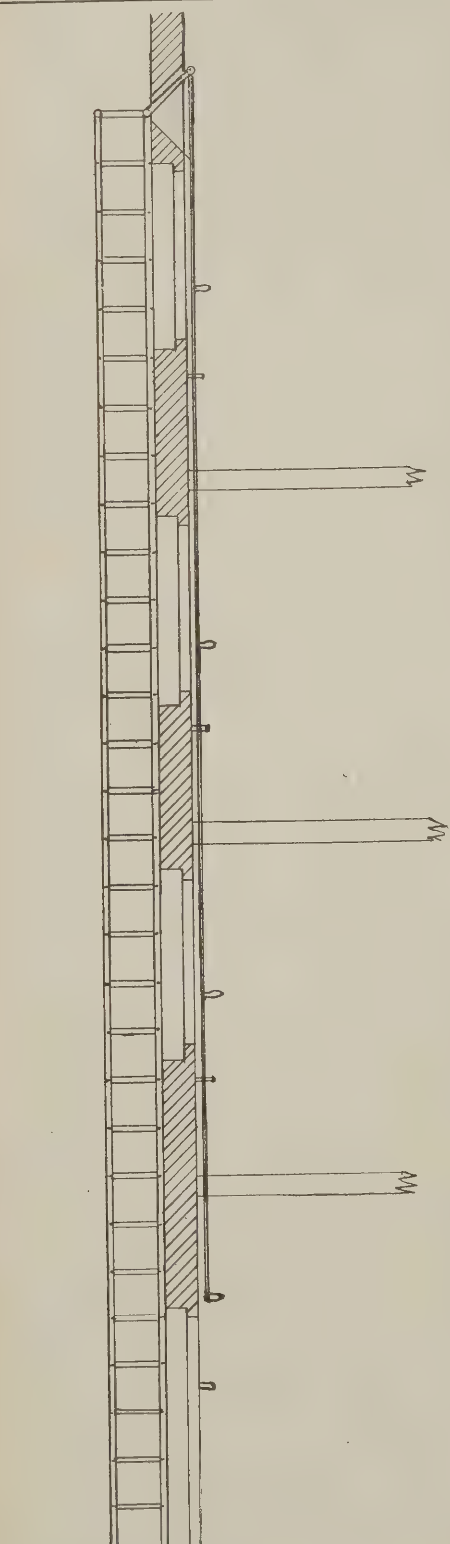


Fig. 1. Open.

Open.

Closed.

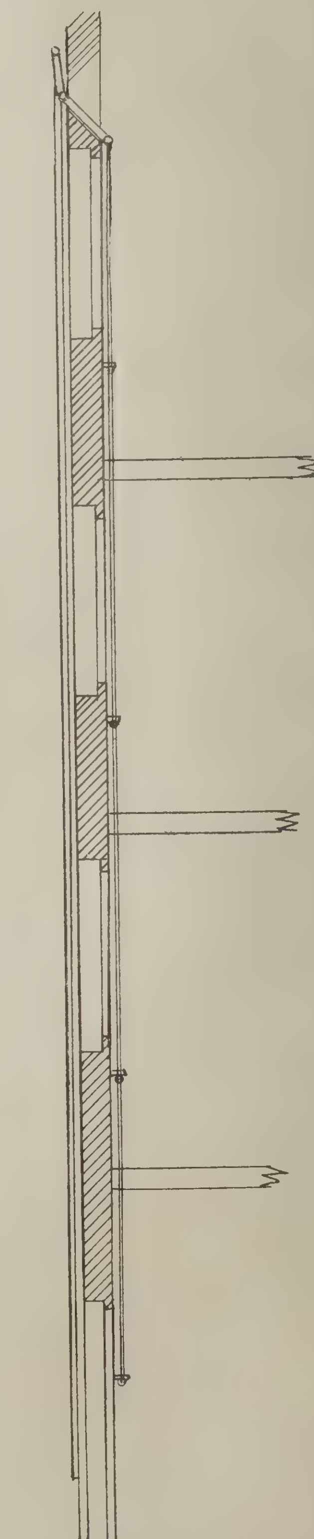


Fig. 2. Closed.

A COLLAPSIBLE FIRE-ESCAPE LADDER.

ROYAL UNIVERSITY PALACE, GENOA: THE STAIRS LEADING OUT OF THE CENTRAL COURT. BARTOLOMMEO BIANCO, ARCHITECT.

nuary 22, 1908. Volume 27, No. 676.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 364, Westminster.

Date of Publication: The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

OUR NEW OFFICES. — As briefly announced in our issue for last week, the editorial and advertisement offices of THE BUILDERS' JOURNAL are now at Caxton House, Westminster, while the publishing office remains at 6, Great New Street. Our new telephone number is 364, Westminster. Telegraphic address as before: "Buildable," London.

Architects' Charges in America.

We are pleased to see that the report on architects' charges presented at the recent convention of the American Institute of Architects has been adopted by that Institute. On another page we give *in extenso* the revised clauses, set forth in a column parallel with the present clauses, which they are about to replace. Although only four of the clauses of the existing schedule are to be amended, yet they include some important revisions comprising—(1) the separation of the charges for residential (or, as we call it, "domestic") work from those applying to the general group of buildings, for which the minimum charge is 5 per cent., and increasing the rate to 10 per cent. on the first \$20,000 (£4,000) of cost, 8 per cent. on the second \$10,000 (£2,000), and 6 per cent. on the remainder of the cost in excess of \$30,000 (£6,000). Thus, on a residence costing \$30,000 (£6,000), the charge is 9⅓ per cent.; on \$50,000 (£10,000) 8 per cent.; on \$100,000 (£20,000) 7 per cent. (2) In fixing the minimum charge on all new works costing less than \$10,000 (£2,000) at 10 per cent., and, further, in stating that such a charge, together with the 10 per cent. stated as the minimum for landscape architecture, furniture, monuments, decorative and cabinet work, is in many instances not remunerative, it being usual and proper to charge a special extra fee for this. It will be seen therefore that the American Institute of Architects has been enabled to find a remedy for grievances of a nature akin to those under which English architects are still suffering. When is that inscrutable "schedule" that was "sanctioned by the Royal Institute of British Architects, confirmed at a General Conference of Architects of the United Kingdom in 1872, and revised, by the Royal Institute in 1898," likely to be transformed into one of a less ambiguous nature?

The Ownership of Architects' Drawings.

In this country the vexed question as to the ownership of an architect's drawings has produced endless litigation and controversy, resulting in judicial rulings to the effect that, under Clause 1 of the Schedule of Charges sanctioned by the Royal Institute of British Architects, *all* drawings, including those of the nature of preliminary studies or sketches, and *all* documents, of whatsoever kind, that have reference to the special work for which the architect's services are employed remain the property of the client on the completion of the building. Professional questions of this kind are managed better in America, where, for instance, this particular one is dealt with in the schedule of professional charges issued by the American Institute of Architects in the following, commendably laconic, manner: "Drawings and specifications, as instruments of service, are the property of the architect." Why is not a clause to this effect introduced in the R.I.B.A.'s schedule of architects' charges, or, as an alternative, why not alter the absurdly misleading Clause 1, so that it may express, in a clear and absolutely definite manner, the views of the Institute on this important question?

Sculpture and Architecture in Edinburgh.

At last week's meeting of the Edinburgh Architectural Association Mr. W. Birnie Rhind, R.S.A., read a most interesting paper on "Sculpture as Applied to Architecture." In a paper which he read some twenty years ago on a similar subject, Mr. Rhind said that he then complained of the lack of opportunity afforded a sculptor of showing what he could do if given a chance on a public building. In Edinburgh then the lack of interest in sculpture was exceedingly depressing, and, alike in art circles and in the public mind generally, the notion was that the highest branch of the sculptor's art consisted in the execution of a portrait bust, varied now and then by an ideal figure, and that anything outside of such routine was beneath the dignity of the sculptor, and belonged to the domain of the decorative stone carver. When, however, they went to a large art centre like Paris, the truth was forcibly brought home to them that the grand field of the sculptor lay, not in the production of what Mr. Ruskin termed "furniture sculpture," but in the designing and execution of sculpture to adorn public buildings, and of monuments to immortalise great men and commemorate great deeds in national history. Mr. Rhind held that in executing mural paintings and sculptural decorations lay the best sphere of the painter's and the sculptor's usefulness, so far as the artistic education of the masses was concerned. It was in connection with works of this character that appealed to humanity at large that all the great artists of bygone ages were known to this generation. Speaking of local circumstances, he said that while matters had considerably improved in the last quarter of a century, it was to be regretted that in a city like Edinburgh so few of their public buildings gave so

inadequate an architectural or sculptural display. Mr. Rhind suggested the completion of the North Bridge by three groups after the style of his group of the King's Own Scottish Borderers, and referred to the want of a school to encourage the stone carver to aim at greater study and higher achievements. They did their best with the teaching material at their disposal, but what he was looking forward to was a department in the new Art School where the student would have an opportunity of practising his hand at designing sculptural compositions in harmony with architecture.

The Report on the Blackfriars Bridge Accident. The report of Mr. Cuthbert Brereton to the Board of Trade on the fatal accident which occurred at the Blackfriars Bridge widening works in November last was issued last week. The inspector says the weight of the caisson was about 240 tons, and the method adopted of raising or lowering it was one frequently adopted, and as a system was, in his opinion, satisfactory. The primary cause of the accident was the unequal lowering of the caisson, which caused the whole weight to be thrown upon two only of the four points of support. The men who could best give an explanation had lost their lives. The appliances used for lowering the caissons would appear to be of sufficient strength for normal use, but it would be desirable that care should be taken to support the weight as uniformly as possible, and to make all girders and other parts of the temporary structure of sufficient strength to take the greatest load that could possibly come upon them. Further, the girders and other portions of the structure should be of a box form, and of sufficient lateral stiffness to withstand sideway strains. It is possible that one of the cocks attached to the jacks may have been broken off by a falling cotter or hammer, and it would be advisable that such a vital part should be protected from possible injury.

A Scheme for Preserving Old London Buildings.—In the "Tatler" for January 15th a scheme is outlined for the preservation of old London buildings by transferring them bodily to a site on the outskirts of the metropolis; not merely as separate buildings, but as part of an "ancient London," and approximating as near as possible to their original surroundings, "so that we may see an ancient street or an old court just as bygone Londoners saw them."

* * *

During the last few years, as the "Scotsman" points out, several underground lakes have been struck in various parts of London in the course of excavations for new buildings, and have given considerable trouble to contractors. A belt of water found in the Horse Guards' Parade, about 10ft. deep and 14ft. below the surface, delayed the building of the last block of the Admiralty offices for several months, during which pumping operations were carried on night and day. Another was discovered when excavations were being made for the headquarters stores depot of the Waterloo and Baker Street Railway in Southwark, and later one was found close by in St. George's Circus, millions of gallons of water being pumped out in every case. The latest underground lake has been struck in the City, at a considerable depth below the surface, in the course of excavations for the new building of the Northern Assurance Co. It is supposed to be a tributary of the Walbrook, one of London's buried streams.

SOME RECENT PRESIDENTIAL ADDRESSES.

The inaugural or other addresses of presidents of the "Allied" architectural societies often contain suggestions or remarks of considerable interest to a far larger audience than that before which they are actually delivered. We have had this in mind when reading three addresses recently delivered at Newcastle-on-Tyne, Manchester and Birmingham respectively.

Mr. Ball's scholarly address to the Birmingham Architectural Association we referred to in our leader columns last week.

With regard to the others, Mr. Plummer (Newcastle-on-Tyne) suggests that the R.I.B.A. should take the provincial architectural societies into closer alliance by allowing each society to have an ex-officio representative, in the person of its president, on the Council of the Institute, and that, in the event of the unification of the profession by means of registration, action should be taken to have it made illegal for a district council to pay an official such as a surveyor, sanitary inspector, or clerk of works, a small salary; at the same time, in order to make it possible for him to live, allowing him to practise and to call himself an architect (whether qualified or not) in the district where, in strict equity, he ought only to be allowed to act in an administrative and advisory capacity.

As to the methods of some of the popular architects of the day, Mr. Plummer makes the following pertinent remarks: "To endeavour to improve upon good architecture, in order to invent an entirely new art, and to be original, at any cost, may draw the attention of the multitude and may draw money into the pockets of commercially-minded men, but I fear they will not be instrumental in obtaining lasting respect and success for architects who employ such methods. To defy all laws of good construction, and of good art, may be possible, and may attract considerable attention, but it is at the expense of obtaining the success of a caricature."

After a passing reference to the so-called honorary architect, upon whose methods we commented a short time ago, and some excellent advice to students, the suggestion is made that the Institute should employ a qualified architect to tour the provinces and give a series of lectures on some of the subjects which students are required to take for the R.I.B.A. examinations.

Mr. Paul Ogden, at Manchester, has made some trenchant, but quite justifiable, remarks relative to advertising and other kindred (though, we fear, general) malpractices. With regard to that very grave evil, the increase of the spirit of commercialism, he rightly remarks that "when greed for fees steps in, architecture flies out." We are glad to see that Mr. Ogden regards "the picture making" architectural student as of small account. A student goes to the Continent and makes sketches of numerous buildings, but with what object it would be difficult for him to say, unless it be that he desires his own people and friends to know that he has been travelling. As to the construction, or reason for any special constructional methods employed in the buildings he sketches, he does not trouble himself. Surely pictures should come from architecture, not architecture from pictures?

After some reference to competition, with which most competing architects will agree, Mr. Ogden instances the following well-known buildings in Manchester as being of a far more scholarly and dignified type of architecture than any of the more modern structures to be found in that city: The Theatre Royal (1845); the Free Trade Hall (1856); the Athenæum Club (1837); the Art Gallery (1823), and the old Town Hall (now the Reference Library) in King Street (1825), and he adds: "I believe that the whole of these buildings, whilst they may not be perfect, are nearer perfection than any other structures of the same class that we have in this country; and they are a wholesome reminder that we had better abandon our present cult, of what is known as 'free' classic, which probably means the wrong application of classic features, and go back to a more dignified class of work as exemplified by those buildings to which I have referred. In modern work, throughout the kingdom, we seem to have lost all sense of dignity and proportion."

THE AMERICAN INSTITUTE OF ARCHITECTS.

Report of the Committee on the Revision of the Schedule of Charges.

At the commencement of this very exhaustive and comprehensive report, the reason governing the appointment of the Committee is thus set forth:—

That whilst the burden and expense of the architect's work have increased enormously in recent years, the basis of his remuneration has remained practically unchanged since the foundation of the Institute.

In amplification of the assertion that the conditions of architectural practice have changed, attention is drawn to the following, namely: "That greater demands, both artistic and constructive, are made upon the practitioner of the present day, that the preliminary training of the architect now requires many years of arduous application, and that the service which the architect is called upon to render is many times more varied and burdensome than formerly, by reason both of the wider prevalence of artistic comprehension and consequent demand on the part of the public, and of new methods of construction, new materials, new sanitary and mechanical equipment."

The report goes on to say that the problems which the architect is called upon to solve "from conception to execution" are infinitely more vast and complex than ever before, and that these altered conditions necessitate, as a natural sequence, "more elaborate, intricate and concise drawings and specifications, and closer and more constant supervision."

Then the augmentation of the architect's working expenses, to suit the altered conditions, is commented on, and reference is incidentally made to the advance in the cost of living, of raised rentals, and to other items of office maintenance.

These statements are self-evident, but, on the other hand, the multitude of new requirements in modern building construction, the greater elaboration of design, the better method of construction now generally adopted, the increased cost of building materials and the higher wages paid to workmen in all the trades, have increased the total cost of building operations. As it is on this total that the architect's remuneration is based, his *gross* earnings are greater, but the point to be considered is whether they are commensurate with the increased service demanded.

The better to arrive at a general expression on this point, the Committee addressed a series of questions to each provincial Society or "Chapter" of the Institute. These questions had special reference (*a*) to the *nett* average compensation of the architect, upon the application of the minimum rates, as defined in the present schedule, to all classes of work indiscriminately; (*b*) upon the possibility of charging upon a system other than that of the one known as the percentage system; (*c*) upon the ability of practitioners to secure the minimum rates of the schedule, and upon charges for expert services and other minor matters.

After classifying and analysing the replies received from twenty-two of the twenty-eight Chapters to which the questions were sent, the Committee recommended the following revisions which are here given parallel with the clauses in the present Schedule which they are intended to replace, the remainder of the paragraphs in that document remaining unchanged.

Professional Practice and Schedule of Charges.

AS AT PRESENT.	AS SUBSTITUTED.
The architect's professional services consist in making the necessary preliminary studies, working-drawings, specifications, large-scale and full-sized details, and in the general direction and supervision of the work, for which the minimum charge is 5 per cent. upon the cost of the work.	The architect's professional services consist of the necessary preliminary conferences and studies, working-drawings, specifications, large scale and full-size details, and in the general direction and supervision of the work, for which, except as hereinafter mentioned, the minimum charge is 5 per cent. upon the total cost of the works executed under his direction.
For new buildings costing less than 10.000 dollars (£2,000), and for furniture, monuments, decorative and cabinet work, it is usual and proper to charge a special fee in excess of the above.	For residential work the minimum charge, except as hereinafter mentioned, is 10 per cent. upon the first 20,000 dollars (£4,000) of cost, 8 per cent. upon the next 10,000 dollars (£2,000), and 6 per cent. upon the remainder of cost in excess of 30,000 dollars (£6,000).
For alterations and additions to existing buildings, the fee is 10 per cent. upon the cost of the work.	For all new works other than residential, costing less than 10,000 dollars (£2,000), for alterations and additions to existing buildings, for landscape architecture, and for furniture, monuments, decorative and cabinet work, the minimum charge is 10 per cent. In many instances 10 per cent. is not remunerative and it is usual and proper to charge a special fee in excess thereof.
Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved.	Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved and services rendered.

None of the charges above enumerated cover alterations and additions to contracts, drawings and specifications, nor professional or legal services, incidental to negotiations for site, disputed party-walls, right of light, measurement of work, or failure of contractors. When such services become necessary, they shall be charged for according to the time and trouble involved.

Where heating, ventilating, mechanical, electrical and sanitary problems in a building are of such a nature as to require the assistance of a specialist, the owner is to pay for such assistance. Chemical and mechanical tests, when required, shall be paid for by the owner.

Necessary travelling expenses are to be paid by the owner.

Drawings and specifications, as instruments of service, are the property of the architect.

The architect's payments are due as his work progresses in the following order: Upon completion of the preliminary sketches, one-fifth of the entire fee; upon completion of working drawings and specifications, two-fifths; the remaining two-fifths being due from time to time in proportion to the amount of work done by the architect in his office and at the building.

Until an actual estimate is received the charges are based upon the proposed cost of the work, and payments are received as instalments of the entire fee, which is based upon the actual cost to the owner of the building or other work, when completed, including all fixtures necessary to render it fit for occupation. The architect is entitled to extra compensation for furniture or other articles purchased under his direction.

If any material or work used in the construction of the building be already upon the ground or come into the owner's possession without expense to him, its value is to be added to the sum actually expended upon the building before the architect's commission is computed.

In case of the abandonment or suspension of the work, the basis of settlement is as follows: Preliminary studies, a fee in accordance with the character and magnitude of the work; preliminary studies, working drawings and specifications, three fifths of the fee for complete services.

The supervision of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk of the works) means such inspection by the architect or his deputy, of work in studios and shops, or of a building or other work in process of erection, completion or alteration, as he finds necessary to ascertain whether it is being executed in conformity with his drawings and specifications or directions. He is to act in constructive emergencies, to order necessary changes and to define the true intent and meaning of the drawings and specifications, and he has authority to stop the progress of the work and order its removal when not in accordance with them.

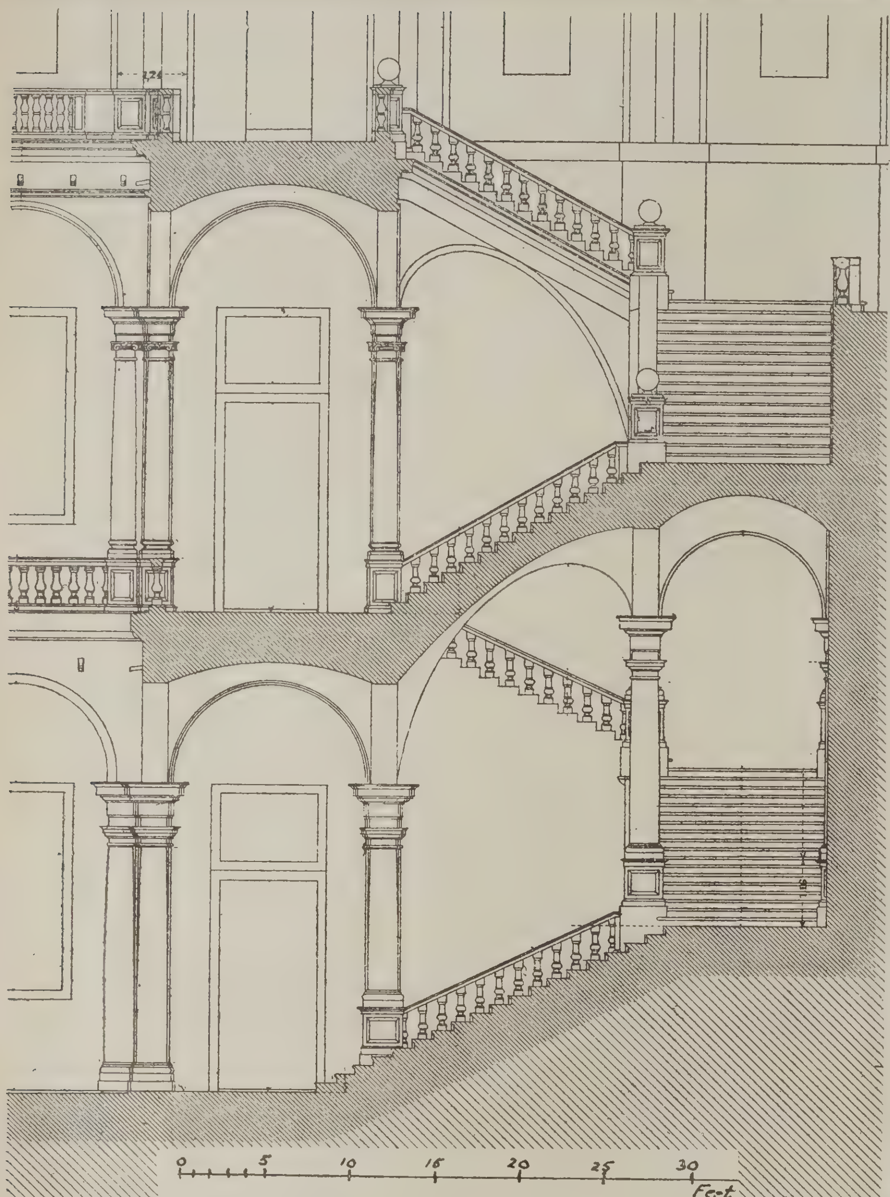
On buildings where the constant services of a superintendent are required, a clerk of the works shall be employed by the architect at the owner's expense.

These cottages are proposed to be executed with local stone, backed with brick; the roofs to be covered with stone slates, all woodwork painted white, and the window openings fitted with iron casements. The architect is Mr. Percy Turner, A.R.I.B.A., of 23, Bank Street, Bradford.

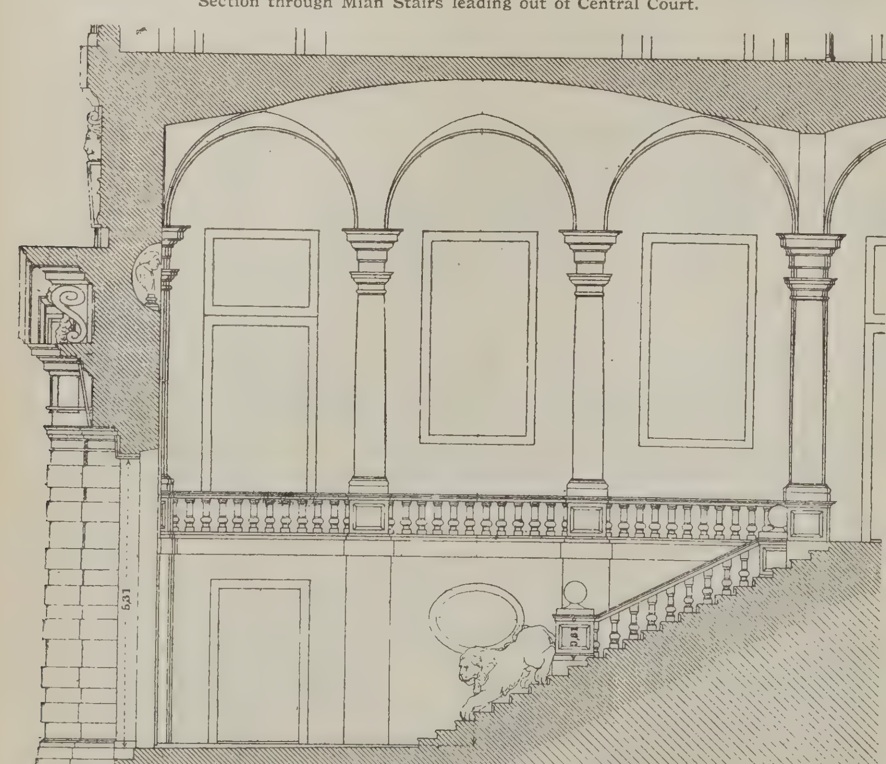
STAIRCASES AT THE ROYAL UNIVERSITY PALACE, GENOA.

The staircases at the Royal University Palace, Genoa, illustrated in this issue, are the most magnificent feature of a very imposing building. Originally erected in 1623 as a palace for the Balbi family, it was used as a college by the Jesuit Fathers, who were entrusted by the magistrates with the supervision of education in the city. On the dissolution of the Jesuits the administration of the college passed into the hands of the Republic, and the Provisional Government of 1797 reinaugurated it as a university in 1803. In 1808, during the French occupation, it was assimilated to the other Imperial academies.

The architect of the original buildings was Bartolommeo Bianco, who also erected two other palaces for the Balbi family in Genoa. From the accompanying plan it will be seen that the scheme of the building is that of a great central court with the rooms ranged around it, the court being arcaded on all sides and the arcading repeated on each storey. The entrance is at a lower level than the court itself, and the staircase which leads up from the entrance vestibule is very finely treated. We reproduce a photograph of it on the opposite page and a section on this page. The finest staircase in the buildings, however, is that which leads out of the central court at the opposite end to the entrance. This we illustrate as a centre plate, and by the section on this page. The columns, balusters, etc., are of white marble and the wall surfaces are treated with plaster.

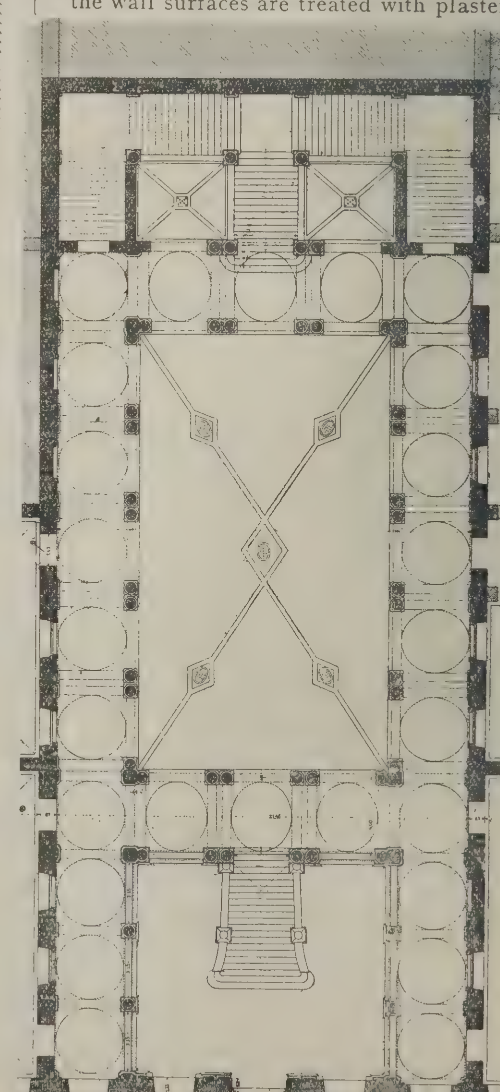


Section through Mian Stairs leading out of Central Court.



Section through Entrance Hall.

THE ROYAL UNIVERSITY PALACE, GENCA.



Ground-floor Plan.

ROYAL UNIVERSITY PALACE, GENOA: ENTRANCE STAIRS LEADING OUT OF VESTIBULE INTO CENTRAL COURT.
BARTOLOMMEO BIANCO, ARCHITECT.

THE RADCLIFFE LIBRARY, OXFORD.

This well-known structure, remarkable as an example of good building even in an epoch noted for its excellent workmanship and sound construction, consists of a galleried rotunda, 100ft. in diameter, raised upon a rustic basement, the plan of which forms a regular polygon of sixteen sides.

This basement, or crypt, serves as a porch entrance to the library above, with which it communicates by means of a large geometrical staircase placed in an oval-shaped well and by two small subsidiary stairways. Around the central domed ceiling of the basement entrance is a stone vaulted arcade, of eight bays, one of which is planned to receive the principal staircase. The library, a circular-shaped galleried room, has a large central area, formed by eight massive piers which support the drum and the upper part of the dome. Notwithstanding the extreme simplicity and, apparently, the spontaniety of its plan, the building is so well proportioned and so happy in the grouping and design of its component parts, that it presents an extremely picturesque appearance, and this despite the fact that the main architectural lines of the composition have been carefully set out (as those of any monumental structure should be) with great restraint.

Above the rusticated basement storey eight pairs of engaged Corinthian columns, 30ft. high, support an unbroken entablature, above which is a balustrade, ornamented with vases.

The drum of the dome, which is pierced by eight large windows, sets back a considerable distance from the front wall of the building, and between the windows there are eight huge stone ramps or console-shaped buttresses.

The lead-covered dome is ornamented with boldly raised ribs and sunk panels, the whole being surmounted by a small lead-covered lantern.

Internally, the chief architectural defect arises from the fact that the large semi-circular arches between the piers carrying the dome are, necessarily, in winding, although there is also a want of uniformity of scale observable in some of the details of the drum of the dome in comparison with those of the supporting arcade below. However, on the whole, the building is a good example of the very best work of a highly accomplished architect. When the University of Oxford was enriched by the munificent bequest of £40,000, left by Dr. John Radcliffe, for purchasing the land and erecting the building, James Gibbs was commissioned to prepare a design for the new Medical Library, and his work forms the subject of a monograph, dedicated to the Trustees and published by him on the completion of the building in 1747. This book, entitled "Bibliotheca Radcliviana; or a short Description of the Radcliffe Library at Oxford," is illustrated by twenty-one copper-plate engravings, many of which are drawn to so large a scale, and so fully detailed, as to form practically a set of working drawings: indeed, the architect expressly states that "it was impossible to make so exact drawings of this large fabrick while it was building, as when the whole was compleated, because there happened unforeseen accidents which occasioned a few alterations to be made to it so that the following representation of it is taken from the building as it now stands." The more interesting of these engravings are here reproduced, each illustration being accompanied by the architect's own description, which is as follows:—

Fig. 1: A plan of "the arched Stone Porch, or Rustic Basement, under the Library, the Ceiling of which is arched with Stone, divided in Pannels, and circular concave Dishes, as is here expressed by pointed Lines. The Dishes are adorned with *Mosaic* Work, the Figure of which shall be shewn in its proper Place. Here are Stair Cases on this plan. The great Geometrical Stair Case being an Oval of Eighteen feet by Twenty-one feet, goes up, by two windings to the floor of the Library. The small Stair Cases being Six feet in Diameter, go up to the Library Gallery, and Leads on the Top of it. The Pavement of this Porch is all laid regularly in Courses drawn from the Center of the Building, the Form of which shall be shewn hereafter."

Fig 2 is the plan of "the Library over the Stone Porch, consisting of two Circles, one within the other. The Diameter of the inner Circle, which supports the Cupola, is Forty-eight Feet. But the Extent of the Diameter of the outward Circle, against which the Presses of the Books are placed, is Eighty-eight Feet six Inches. When you stand in the Center of the Room you see the Book Cases through the seven great Arches of the inward Circle, which Book Cases are all curiously framed of right Wainscot, and their Mouldings neatly carved. The room where they are placed is of a Circular Form, going from one round Stair Case to the other, Fifteen Feet broad and Twelve Feet high, raised six Inches above the Stone Floor of the middle Circle, and floored with right Wainscot Boards, all laid to the Center of the Building; its Ceiling is handsomely adorned with Fret Work, and the whole Room lighted by seven Windows. The Floor of the middle Circle is paved with Portland Stone intermixed with red Swedish Stone, drawn from several Centers; the Form of which shall be shewn hereafter. The seven small oblong Squares marked in Lines at O, against each Window, on the Plans of the Library and Gallery Floors, shew where the Desks are placed, and P shews the Presses for the Books."

Fig. 3 is the plan of "the gallery, or upper Library, with its Balustrade in Front, to which you ascend by the two small round Stairs bb. The Book Cases at P are placed as below. The Desks placed at each Window, marked O, are all handsomely framed of Mahogany Wood polished. The Ceiling is coved, as is here expressed by pointed Lines and embellished with Fret Work, and the whole lighted by seven large Windows."

Fig. 4 shows "the Plan of the Leads or Flats over the Galleries, and the Balus-

THE RADCLIFFE LIBRARY, OXFORD. JAMES GIBBS, ARCHITECT

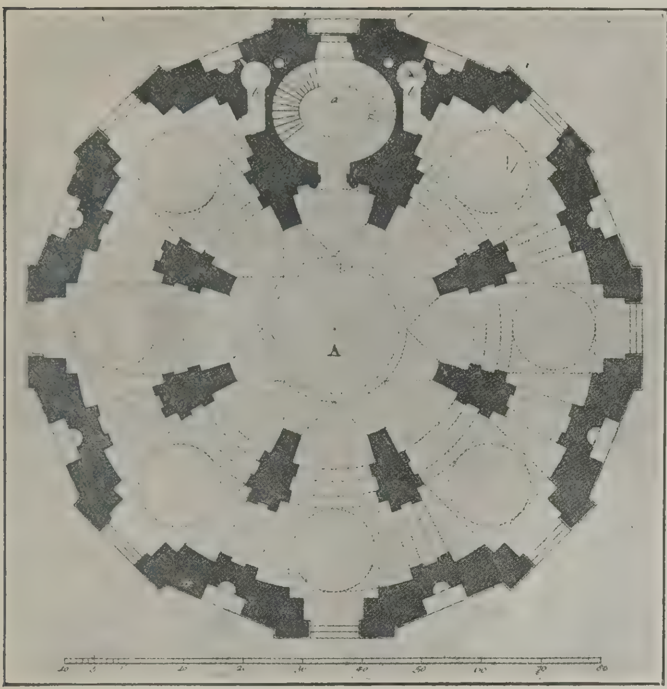


Fig. 1 Basement Plan.

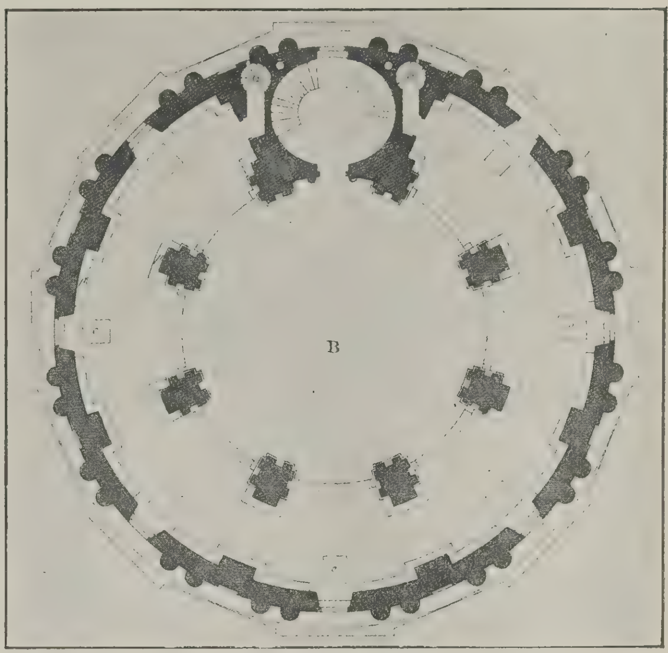


Fig. 2. Plan of Library.

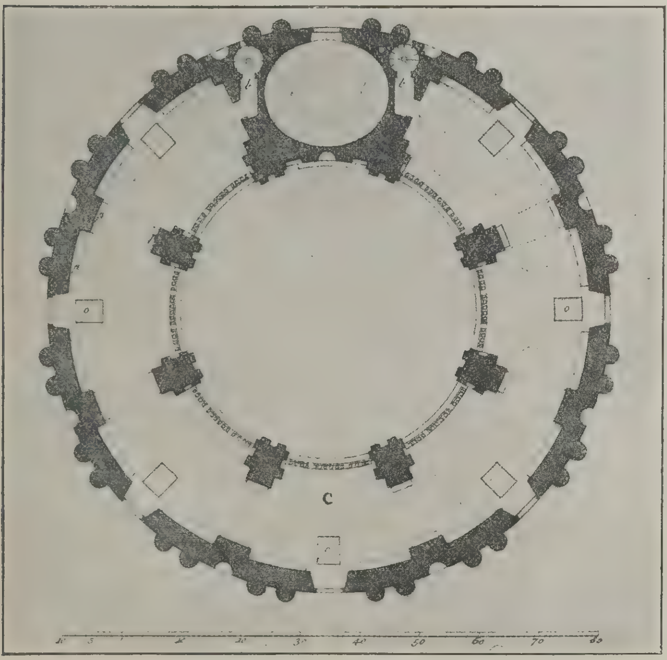


Fig. 3. Plan of Gallery or Upper Library.

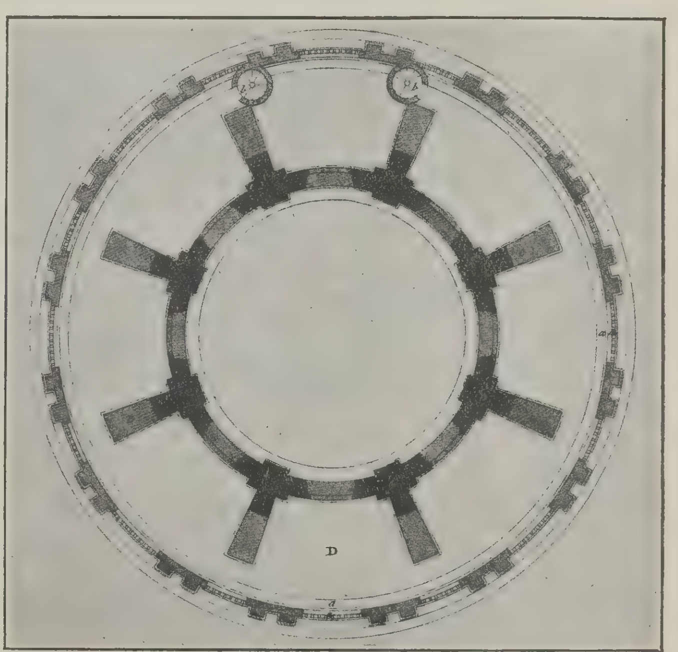


Fig. 4. Plan of Cupola.

trade that goes round the Building, aa; the two round Stair Cases going up to them, bb; and the Drum and Buttresses of the Cupola, cc; the Cupola and Lanthorn being all covered with Lead."

Fig. 5 "You have here a Part of the Upright of the Outside of the Building drawn larger, to shew more distinctly the Ornaments of the Corinthian Order, the Disposition of the Windows and Niches with their Dressings, the Entablature, with the Number of its Modilions answerable to their Intercolumnations and the Range of Pedestals, and Balustrade a-top of it, with their Vases."

Fig. 6. "A section, through the Middle of the Rustic Basement, across the great Stair Case, shewing the Rising and Winding of the great Stairs, as likewise the Arches, Galleries, Part of the Drum of the Cupola, Cove over the great Stair Case, and Timber Framing, the Profile of the Windows and the Thickness of the Wall, etc."

Fig. 7. "A Geometrical Profile through one Bay of the Building shewing a Part of the Rustic Basement; as likewise of the circular Rooms where the Presses for the Books are placed and the Entry to them from the Doors of the round Stair Cases, the Framing of the Roof of the Galleries and the upright bearings and Abutments of the Cupola."

Fig. 8. "This is the Niche, with its ornaments, over the Ionick Door Case within the Library as you enter it, where the Doctor's Figure stands in his Academical Habit, curiously done in Marble by Mr. Michael Rysebrack, a noted Sculptor. This Niche is contained within one of the great Arches which supports the Cupola, over which there is a Marble Table with this Inscription:

IOHANNES RADCLIFFE, M.D.
HUIUS BIBLIOTHECÆ,
Fundator."

Fig. 9: "This is a Geometrical Upright of one of the great Arches within the Library, to show the Fronts of the Gallery or upper Library, its Cornish and Balustrade, the Scrolls abutting against the great Pilasters for the Support of the Floor of the Gallery; as likewise the Windows of the Library below, and the Gallery above."

Fig. 10: "Here is shewn one Quarter Part of each Pavement in the Building, the lowest (*a*) belongs to the Stone Porch under the Library which is of a hard Sort of Stone, all laid in Courses, drawn from

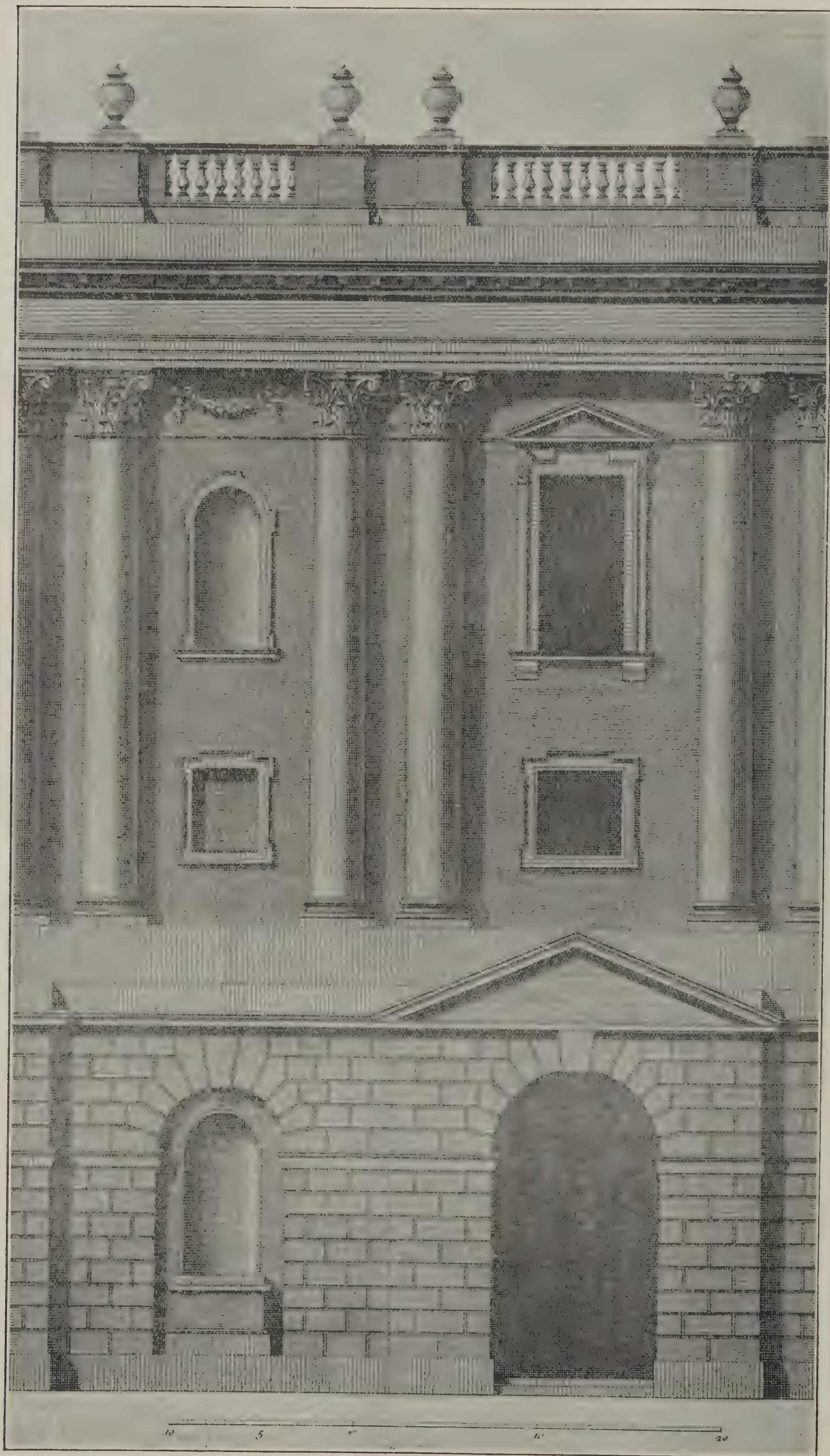


FIG. 5. RADCLIFFE LIBRARY, OXFORD: DETAIL OF FACADE.

the Center of the Room, as here expressed. That above (*b*) is the Pavement of the middle Part of the Library, which is of Portland Stone, intermixed with red Swedish or Bremen Stone, drawn from several Centers. This Floor was first proposed to be of black and white Marble polished, but was rejected, being thought improper for the Place, because the air condensing upon it, occasioned by its Hardness (which commonly, though improperly is called sweating) makes the Place damp, especially where no Fire is kept, and is fitter for Churches, Portico's, Common Halls, and Passages, than a Library."

Fig. 11. "Here are the Ornaments of the Circular Concave Dishes in the Ceiling of the Rustic Basement, or Stone Porch, below the Library, being all arched with Stone, and the circular Concave Dishes adorned, in this Manner, alternatively with *Mosaic* Work the one with Octagons, and the other with Crosses and Octagons, having the Doctor's Cipher in the Center within a Circle. The Ceiling of the great Arch in the Middle of the Porch, is grinded over, and has the Doctor's Coat of Arms, enclosed within a large Circular Moulding, going round it, handsomely carved."

Fig. 12. "This shews the great Modilion Cornish, with its Frieze fully enriched, which goes round the Inside of the Building, over the great Arches that support the Cupola; I have likewise drawn here a Part of three of the Arches, to shew the Ornaments which are put in the Spandrels, between the Architraves of the Arches."

Fig. 13. "This is one-eighth Part of the Ornaments of the Dome in the Inside of it, with their Profiles, letter'd and figured, the Whole curiously done in Fret Work by Signior Artari, an excellent Artist. A, one eighth Part of the Ornament extended on a straight Line; B, the Profile or Section of the Panels; C,C, the Geometrical Profile from the Middle of the Rose to the outside Border."

Fig. 14. "A, Plan of the Frame, or Half of the Outline, or Circumference of the Cupola, shewing the Thickness of the Walls and how the Dome is framed and supported; aa, the bearing Pieces for the Truss, on which the Lanthorn is framed, bb, the Beam or Girder of the Truss, cc, the upright Posts which form the Lanthorn. The four Divisions in the Plan shew the Timbers which fill up the Spaces within the trussed Frame, 1,1, two half Trusses; 2,2, the Purloins or Cross Timbers; 3,3,3 the Furring for the Outline of the Dome; 4,4, the Bridging on which the Boards are fixed for the Lead Covering."

"B shews the Upright of the principal Wooden Truss, which forms the Inside of the Dome and Outline of the Cupola and Lanthorn and its Framing, all of Heart of Oak, being an excellent Piece of Carpentry well considered and executed in the best Manner, the Ends of the Timbers being fixed in Shoes of Metal, to preserve them from any Damp that might affect them from the Stone, the Timbers here lettered refer you to the plan below it."

The last plate of the work consists of large-scale detail drawings of the "Ornaments, of the several Orders, made use of in this Building," and the author appends the following note, which many architects of to-day would do well to "read, mark, learn, and inwardly digest," namely:—"All the mouldings, both without and within the Building, are carved proper to their Order."

Views and Reviews.

Decorative Devices.

This is a practical book issued by "The Decorator," under the editorship of Mr. Arthur Seymour Jennings. Like the others in the same series, it is admirably produced, and if it does not go deeply into the symbols recorded, it provides a great deal of enlightening information that will be thoroughly serviceable to decorators, and will prevent the inaccuracies in symbolic details so often seen in decorative work. The book, too, has an interest for architects.

"Decorators' Symbols, Emblems and Devices." By Guy Cadogan Rothery, with original designs by E. Fletcher Clayton. London: The Trade Papers Publishing Co., Ltd., 3, Birkbeck Bank Chambers, W.C. Price 3s.

French Building Construction.

Those who have to deal with French building construction, or who are able to read French easily, will find this pocket

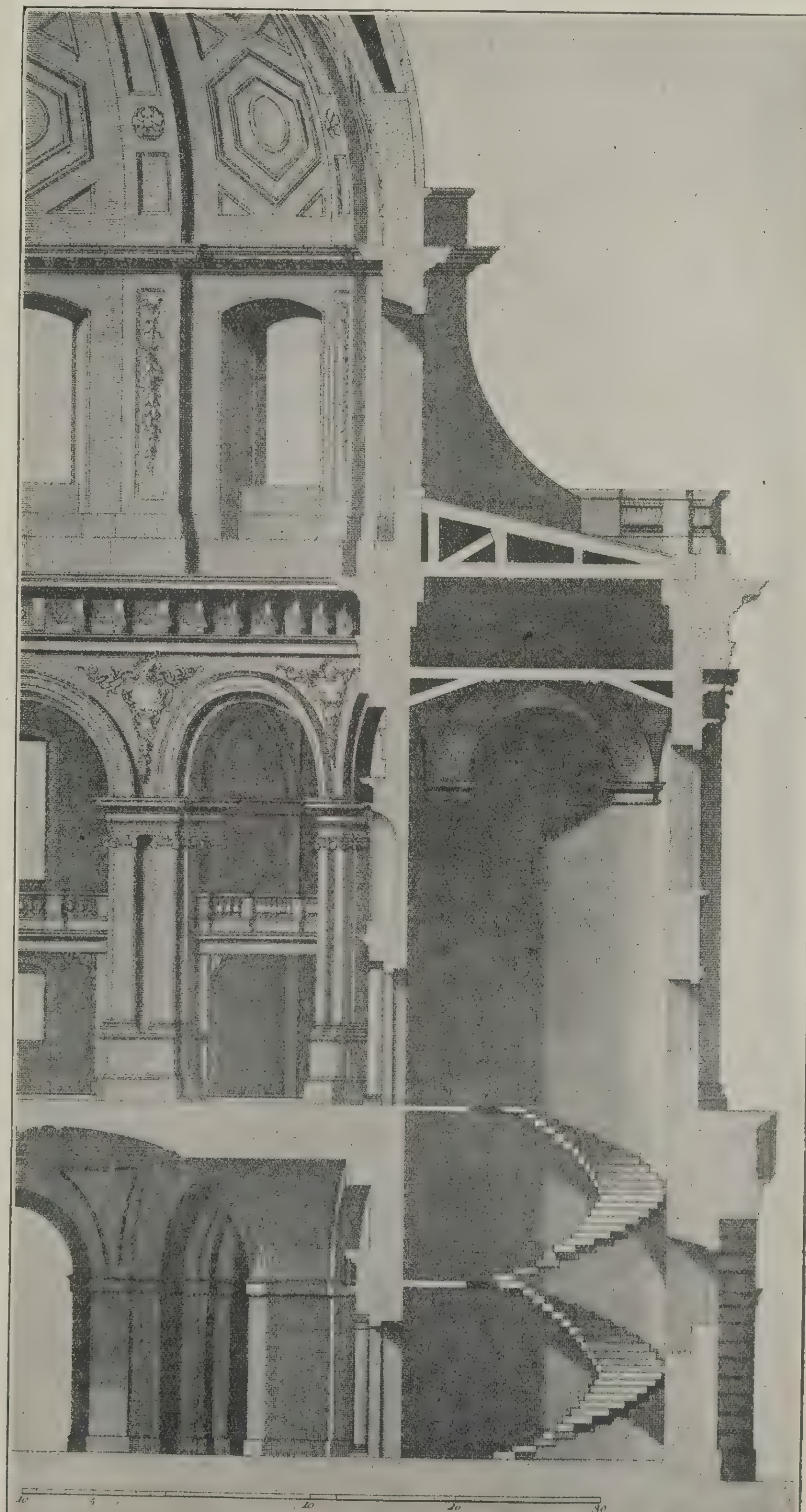


FIG. 6.—THE RADCLIFFE LIBRARY OXFORD: SECTION THROUGH LIBRARY AND STAIRCASE.

diary of considerable service. It is a useful work of reference, because it contains a great deal of summarised information upon building construction in general, and upon French regulations and French methods of building in particular. For example, it gives the Ministerial circular on the use of reinforced concrete which was recently issued, and now governs reinforced concrete construction in France; also the general conditions imposed on contractors for bridges and road works by the French minister of public works. Another section of the work contains the French law regarding the responsibility for accidents to workmen engaged in construction; while one particularly valuable feature is a list of prices current in Paris.

"Construction." By A. Debauve, Inspecteur General des Ponts et Chaussées, and E. Aucamus, Ingénieur des Arts et Manufactures. 30th edition, revised and enlarged. Paris: H. Dunod and E. Pinat, 49, Quai des Grands-Augustins. Price 2 francs 50c. (2s.)

Estimating for Roads, etc.

Mr. Housden, whose hydraulic tables and diagrams are reviewed on p. 79, has also produced another valuable aid-book to practice. These earthwork tables have been prepared with a view to reducing the labour necessary in the preparation of estimates for roads, railways, canals, earthen dams, etc. They are certainly simple and easy of application, and sufficiently accurate for all practical purposes.

"Practical Earthwork Tables." By C. E. Housden, Superintending Engineer, P.W.D., India. London: Longmans, Green and Co., 39, Paternoster Row, E.C. Price 3s. 6d.

A Series of Technical Books.

Messrs. Archibald Constable and Co., Ltd., have recently published several volumes uniform in character, size and binding, belonging to what they term their "Westminster Series." The volumes we have received deal specially with iron and steel, electric power, coal, liquid and gaseous fuels, town gas and india rubber. All alike treat the subjects in an interesting manner, and are very readable. They are not exactly text-books, nor exhaustive treatises, but more in the nature of reviews of the present position of each industry. They form excellent introductions to the subjects dealt with, and are a welcome addition to the range of technical literature.

"Iron and Steel." By J. H. Stansbie, B.Sc., F.I.C.
"Electric Power and Traction." By F. H. Davies, A.M.I.E.E.
"Coal." By James Tonge.
"Liquid and Gaseous Fuels, and the part they play in Modern Power Production." By Vivian B. Lewes, F.I.C., F.C.S., Professor of Chemistry at the Royal Naval College, Greenwich, Chief Superintending Gas Engineer to the Corporation of the City of London, etc.
"Town Gas and its Uses for the Production of Light, Heat, and Motive Power." By William Hosgood Young Webber, Staff Instructor and Lecturer to the Gas Light and Coke Co., London.
"India-Rubber and Its Manufacture," with chapters on Guttapercha and Balata." By Hubert L. Terry, F.I.C.
London: Archibald Constable and Co., Ltd., 10, Orange Street, Leicester Square, W.C. Price 6s. nett each volume.

A Concise Book on Electric Power.

The increased adoption of electric power for driving machinery has rendered it necessary for business men to gain some little knowledge of the subject, and the purpose of this book is to supply that want. There are various books published on the subject of electrical engineering, but the majority of these deal either very fully with the subject from a theoretical point of view, or else specialise in one particular branch. This book sets out to help those who in some way are connected with electrical plant, but who have not had the benefit of a regular training in electrical engineering. Hints are given on the selection, erection, testing and running of electrical plant; simple theoretical explanations are included, and the attention of buyers is directed to the particulars that should be furnished to a manufacturer to enable him to supply a thoroughly suitable article. The book is concisely and clearly written, and will be found of considerable service to anyone wishing to gain a general knowledge of the subject easily and quickly.

"Electric Power Users' Handbook." By E. Hunter-Brown. London: Hodder and Stoughton. Price 5s. nett.

The Panama Canal.

The Panama Canal, although purely an engineering work, is of interest to all persons connected with construction in its broad aspect. It is the largest contract at present being executed anywhere in the world, and it must have great influence on the future history of the world. We read with much interest therefore, in the volume under review, an authoritative statement (by the Engineer of the French canal) on the great project which was initiated by De Lesseps and is now being carried to completion by the United States Government.

"Le Détroit de Panama," by Philippe Bunau-Varilla, ancien ingénieur des ponts et chaussées, ancien ingénieur en chef du canal du Panama (1885-1886); ancien ministre plenipotentiare de la Republique de Panama à Washington (1903-1904). Paris: H. Dunod et E. Pinat, 49, Quai des Grands-Augustins. Price 10 francs (8s.)

(*Continued on p. 79.*)

FIG. 17. THE RADCLIFFE LIBRARY, OXFORD: SECTION.

THE RADCLIFFE LIBRARY, OXFORD.

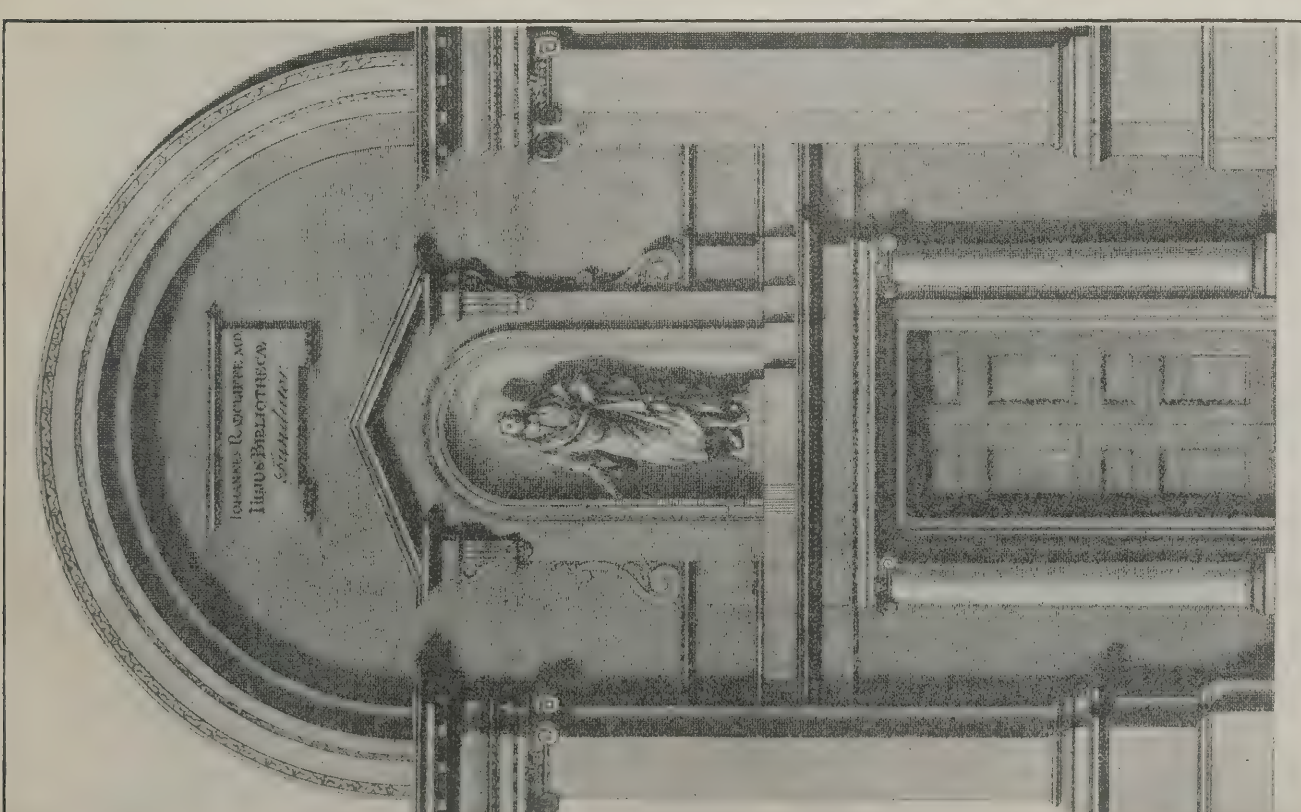


Fig. 8.—Entrance Door inside Library.

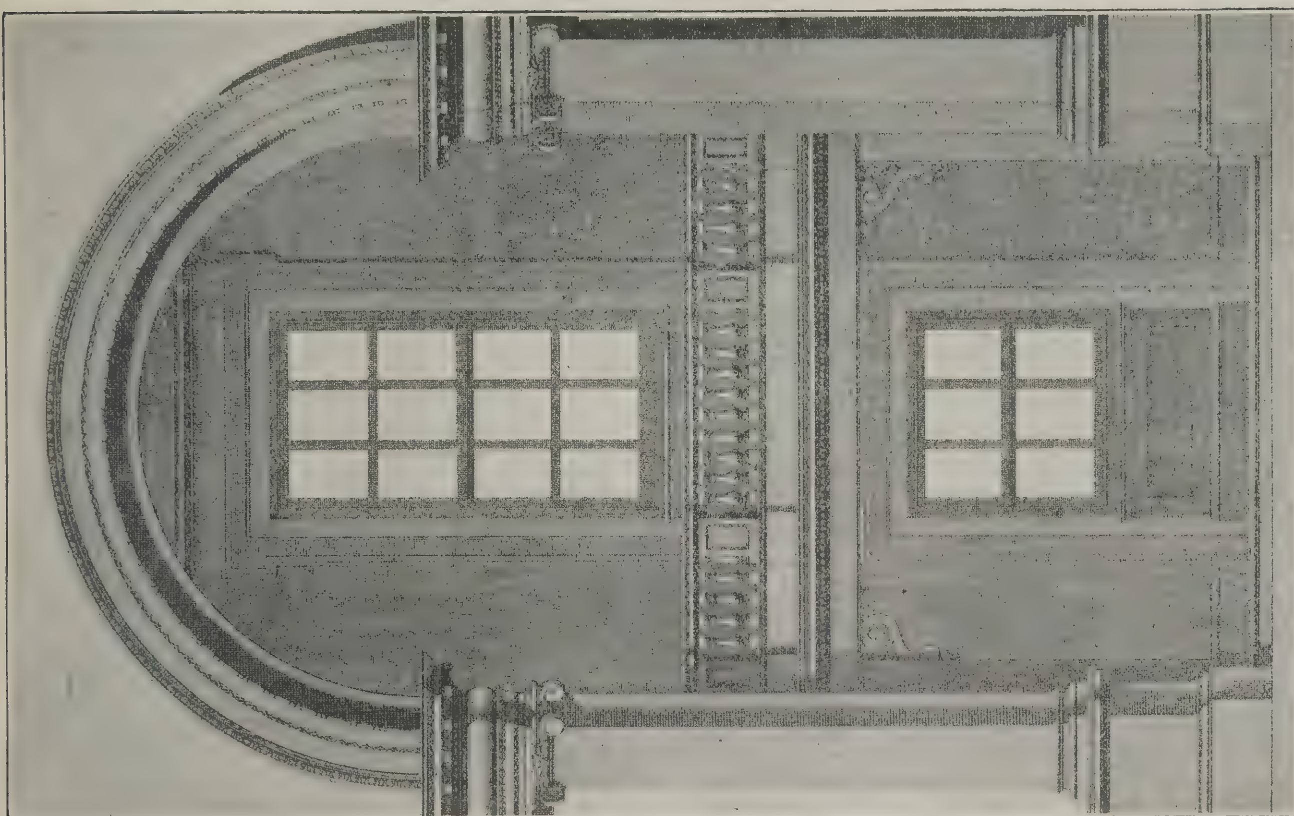
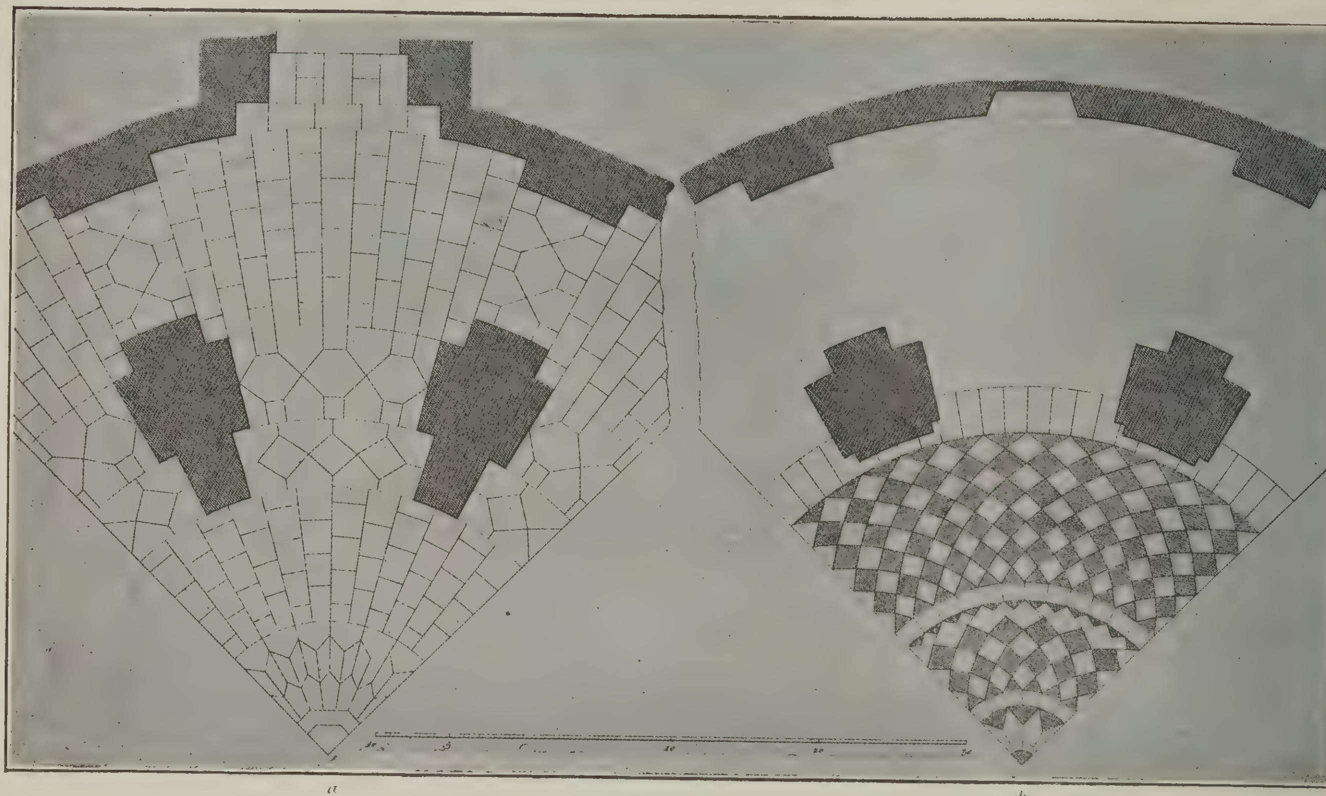
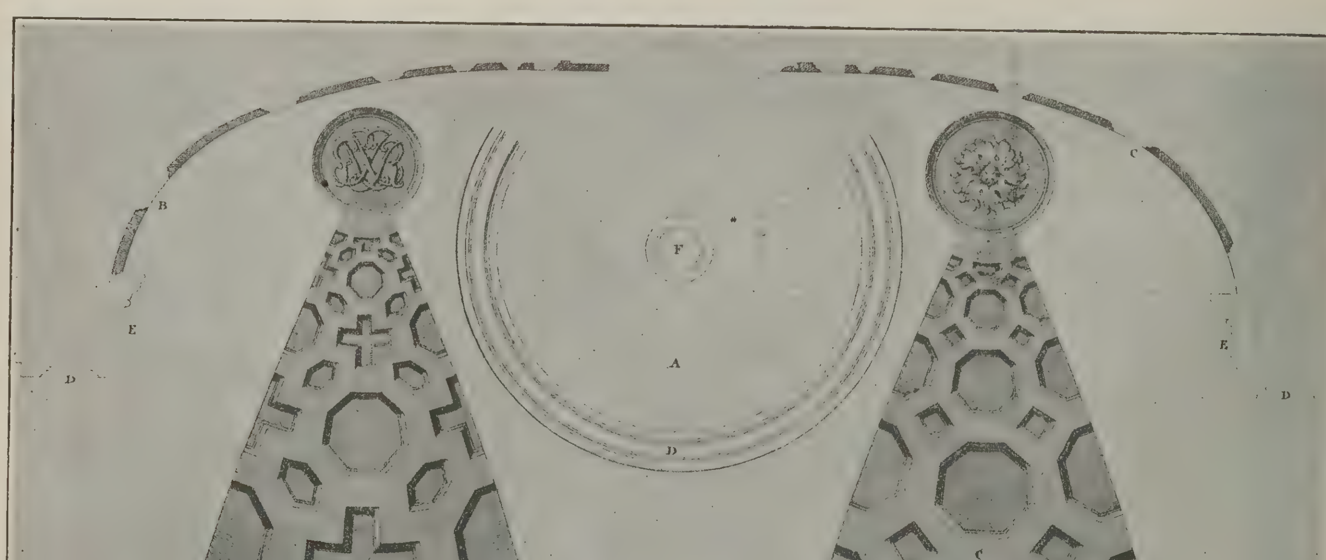


Fig. 9.—One of the Arches, with Gallery Front.



FIG, 10—ONE-FOURTH PART OF PAVEMENT TO PORCH AND OF LIBRARY ABOVE.



FIG' 11.—MOSAIC WORK ON PORCH CEILING.

THE RADCLIFFE LIBRARY, OXFORD.

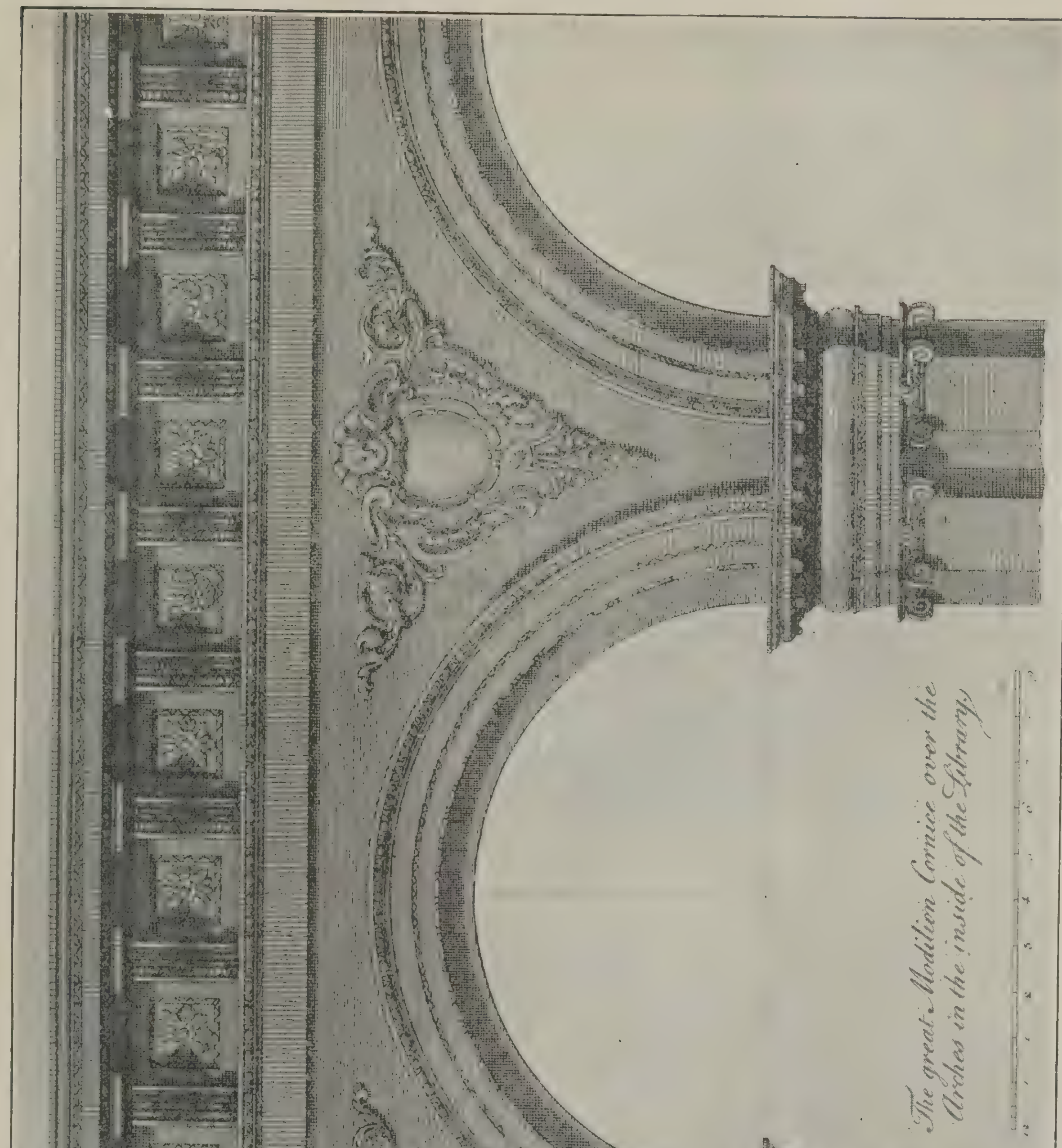


Fig. 12.

THE RADCLIFFE LIBRARY, OXFORD.

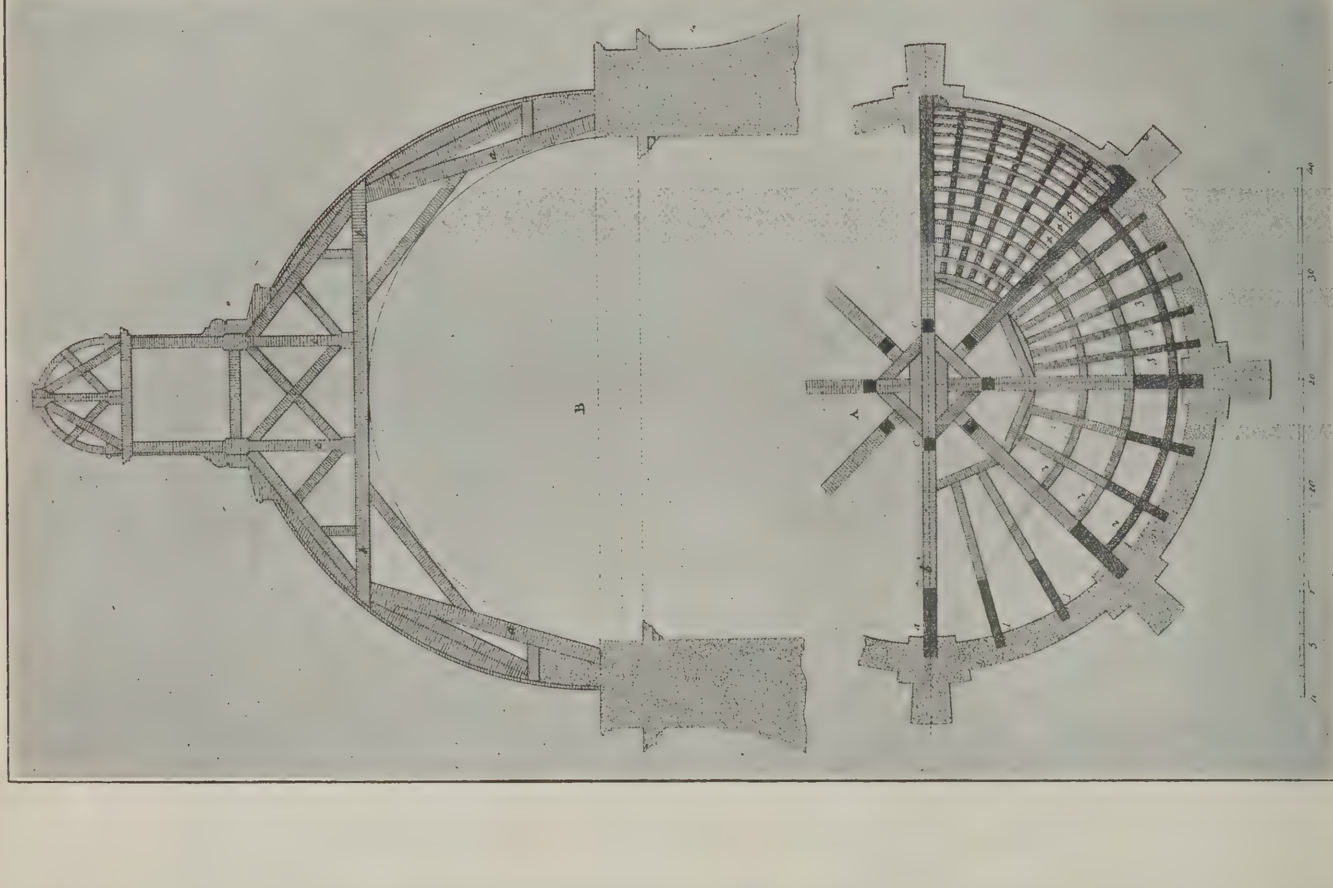


Fig. 14. Plan and Section showing Wooden Framing of Dome and Lantern.

Fig. 13. One-eighth part of the Decoration on the inside of the Dome.

THE RADCLIFFE LIBRARY, OXFORD.

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible. The querist's name and address must always be given, not necessarily for publication.

Provisional Sum for Foundation-Stone Trowel and Mallet.

DEVON.—IMPECUNICUS writes: "Can you inform me what is the usual practice with regard to the provision of trowel and mallet for foundation-stone laying? In this part of the country every community which erects a chapel or hall seems to expect the architect to provide the utensils. Would he be justified in inserting a provisional sum to cover their cost—is this a common practice?"

Neither law nor custom lays upon the architect any obligation to provide the tools for the laying of a foundation-stone. If such a ceremony is to take place, the builder has also a great deal to provide, and it is only fair that a clause should be inserted in the specification dealing with the matter. A provisional sum may be inserted, or some indication given as to what is proposed to be done.

X.

Division of Fees.

CAUTIOUS writes: "(1). Is it legal for an architect to allow a friend a part of his commission received for work done for a third party introduced or influenced by the friend? (2). Is it necessary for an architect and surveyor to take out an appraiser's license (£2 2s.) before reporting on property and advising as to an amount which may be safely lent on mortgage? (3). In the event of an architect being instructed by a solicitor to survey and report on a property and to advise as to the amount which may be lent on mortgage, in a district where the architect has no special knowledge of the values of property, what course should be pursued? Must he state that he has no special knowledge of values in that district, or may he take the advice of a local surveyor and share fees; if so, should the local surveyor's name appear in his report?"

(1). Yes. Commissions are quite usually divided in this way; the client only pays the usual or agreed fees, and there is no question of underhand dealing in the matter. (2). Every person making an appraisement for the information of two parties (i.e., such as an award under a reference) must take out a valuer's license; but if the work be for the information of one party only he need not take out such a license. In the particular case mentioned, no license is required. (3). Any report made by the architect will, of course, be sent in upon his personal responsibility. There is no reason, however, why he should not himself take local advice upon the question of value; in fact, it is unfortunate that so wise a course is not more frequently pursued.

F.S.I.

Secondary Schools.

IPSWICH.—X. writes: "Have you published any plans of secondary schools in the West Riding of Yorkshire, Dorset, and Cornwall, and Poole? If so, please state the issues."

Plans of the following secondary schools were illustrated in our columns last year:—Goole (Willink and Thicknesse, 1st) March 6th; Bishop Auckland (E. F. Reynoldr, 1st) April 24th; Wallasey (Appleyard and Quiggin, 1st) May 29th; Castleford, Yorks (Percy Robinson and W. Alban Jones, 1st; W. S. Braithwaite, 2nd and selected) June 5th; Rotherham (Holgate and Harrison, 1st) December 11th.

Floor for Elementary School.

OXFORDUS writes: "(1). What kind of wood floor is most suitable for a school? (2). Do you consider the following (abbreviated) specification sufficient:—Lay 6 ins. of lias lime concrete (1 to 6) with $2\frac{1}{2}$ by 2 ins. splayed oak battens bedded-in (16in. cnetres), projecting $\frac{3}{4}$ in. above the concrete; float between battens (flush) with $\frac{3}{4}$ in. cement and sand 1 to 3; cover with $1\frac{1}{4}$ in. red deal battens 4 ins. wide, square-edged, nailed to the oak battens. (3). How can the floor boards be cramped up? (4). The boards being close on the cement floating, is there danger of their decaying quicker than if the floor were constructed in the ordinary way with sleeper walls, plates, joists and grooved and tongued boards?"

(1). A pitch-pine floor of wood blocks in short lengths, keyed, jointed, and laid on concrete on a thick bed of tar. (2). This type of floor is faulty. The use of bitumen is not suggested, and timbers are liable to be assailed by dry rot. (3). By temporary nailing one a short distance away and then wedging up from it. (4). Yes. I advise the use of No. 1; the initial cost is somewhat greater, but the result is far more satisfactory.

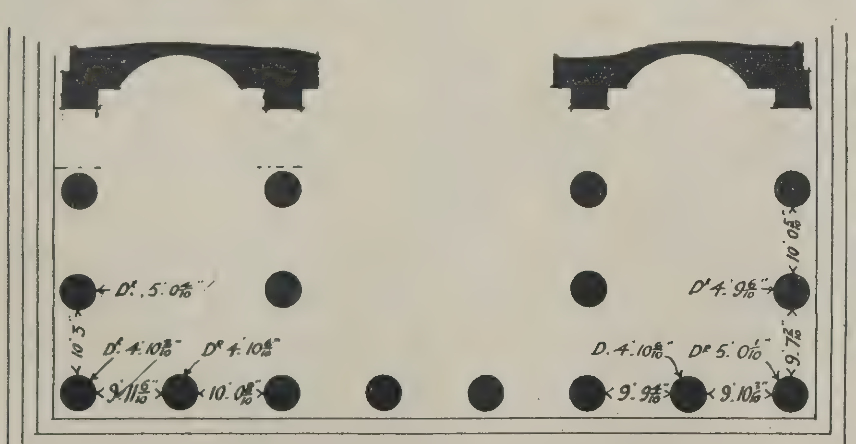
F.R.I.B.A.

The Portico of the Pantheon at Rome.

CROYDON.—S.S. writes: "I desire to know the *exact* dimensions between columns at the corner of the portico to the Pantheon at Rome. Can you give this?"

The exact dimensions of the corner intercolumniations of the Pantheon portico are as shown on the accompanying sketch plan; all are measured at bottom of shafts. Note that the angle columns are thicker than others, but that, owing to the one on the left and the adjoining column on flank having been removed and transposed in replacing the intercolumniations at this angle are incorrect.

G.



PLAN OF THE PORTICO TO THE PANTHEON, ROME.

A Party Wall.

J.D.I. writes: "I shall be glad to have your opinion in regard to a certain party wall. The parties concerned are A and B. A's house is leasehold, and was built before B's. B had permission to put his timbers for roofing on the pine end. No deed or agreement was ever entered into, and whether payment was made or not is unknown, as people sixty or seventy years ago were not so business-like as they are now. No rent was paid for its use. In due time, A's lease was renewed, and B's ground was bought as freehold. Alterations were made: A reslated the roof to half the pine-end, and the eave-troughing was only put to half the pine-end; also the steps leading to B's door are let into the party wall. Everything of late years clearly shows that B claims half the wall. Who is right?"

The fact that A's property is leasehold, whilst B's house is a freehold, makes no difference whatever with regard to their respective rights in the wall dividing the two properties. There is no doubt whatever, that, upon the facts stated, this division wall is of a party character, and must be so regarded in future. Whether or no it was so built in the first instance, does not now affect the case.

F.S.I.

Stage III. Building Construction.

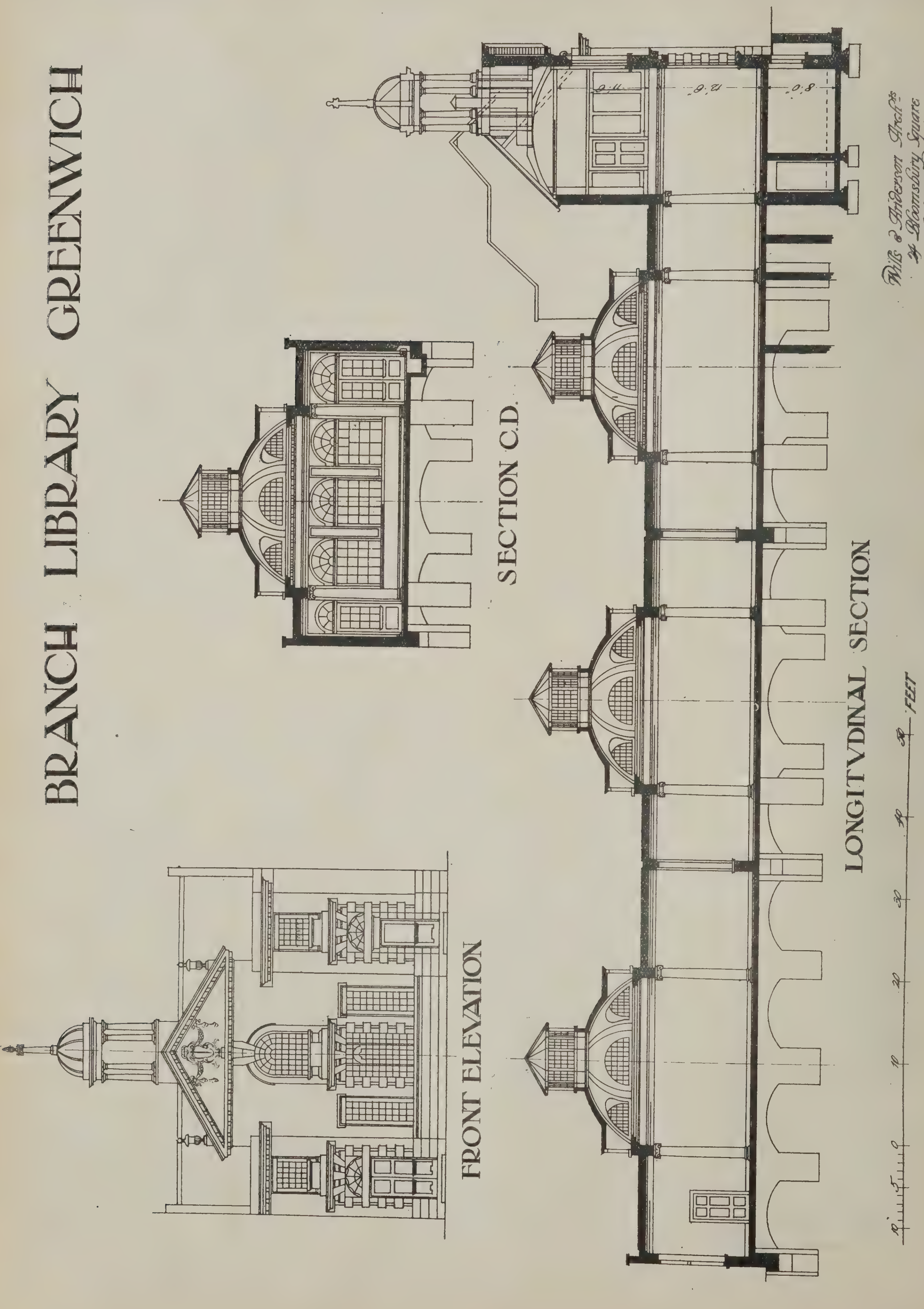
S. writes: "Where can I obtain this year's Syllabus for Stage III. Building Construction? Would Rivington's first three books be enough to pass in this subject? If not, what other book do you recommend? I intend to sit in May."

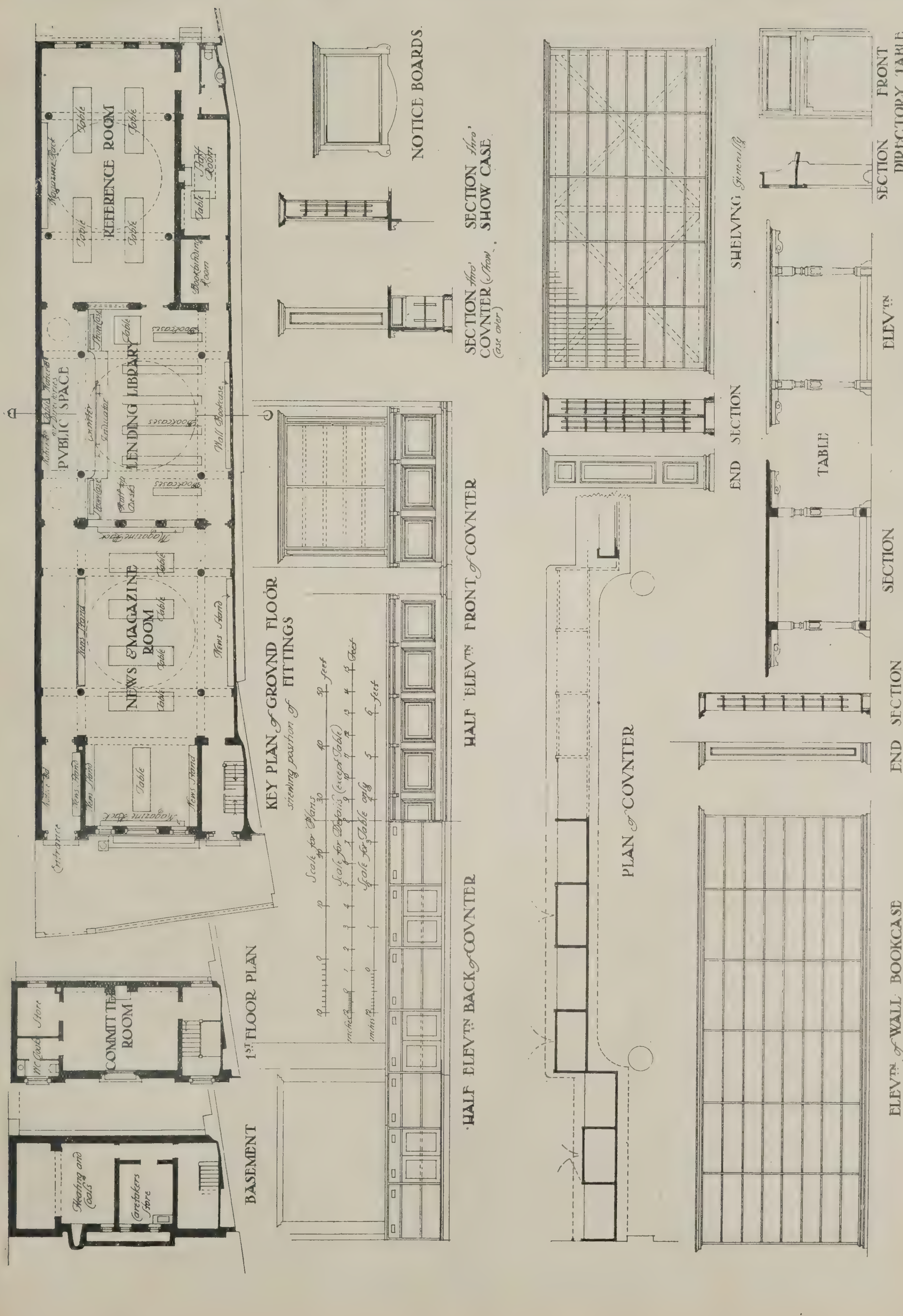
Text-book knowledge alone should not be relied upon for passing the Building Construction Examination in Stage III., but the books named are suitable aids, with the addition of one on elementary graphic statics. In the last report on this subject and stage, the Board of Examiners state: "The great fault in the answers was the lack of practical knowledge," and there were 383 entire failures out of 1,045 candidates.

HENRY ADAMS.

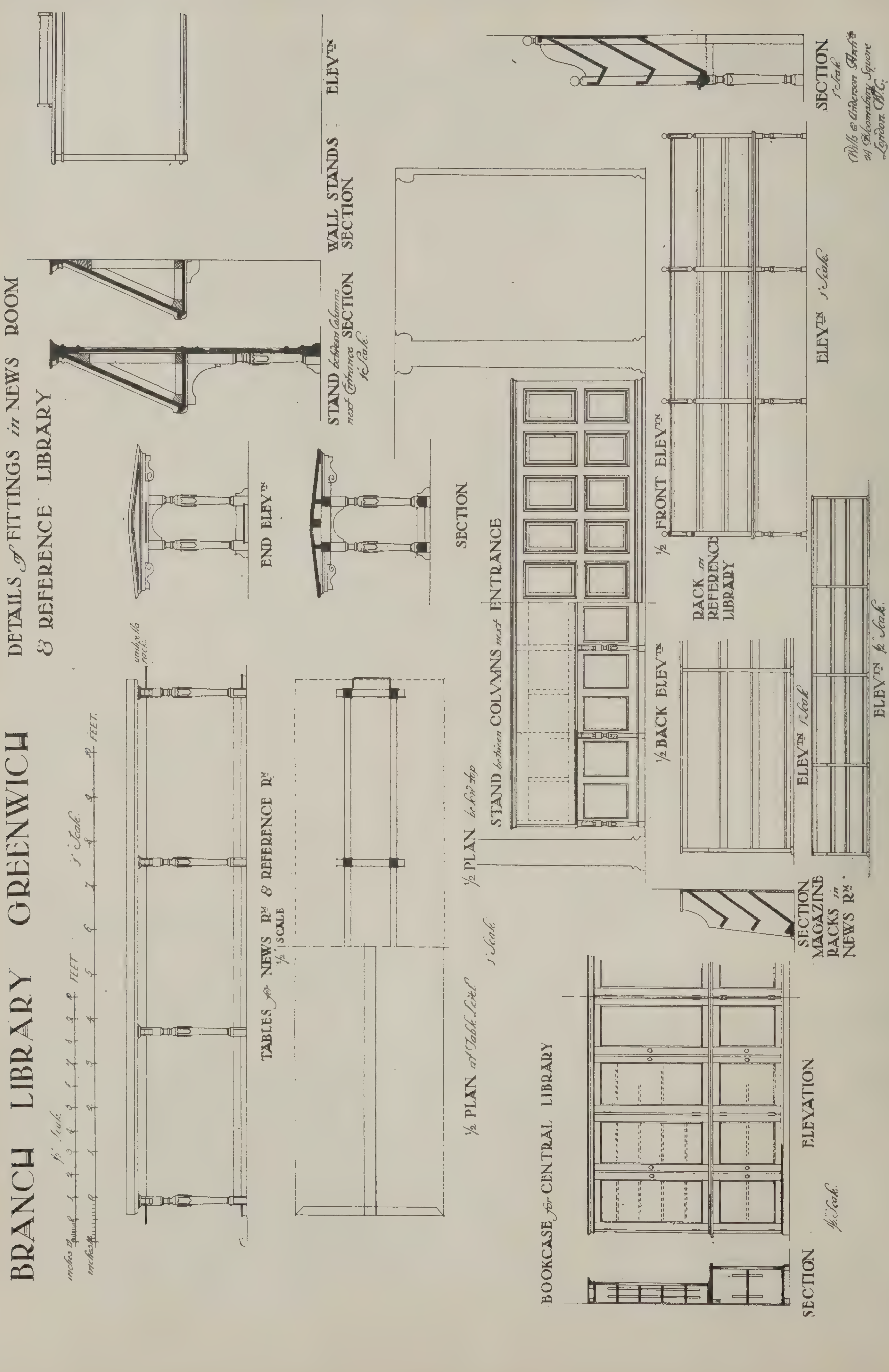
GREENWICH LIBRARY.

On the three following pages we reproduce some drawings of the new branch library which has recently been erected at Greenwich from designs (selected in competition) by Messrs Wills and Anderson, of London. The total cost of the building and its fittings was about £6,000. The cost of the library fittings and furniture (executed by Messrs. Maple and Co), in English oak, was about £600. The general contract for the building was let to Mr. F. J. Gorham, of Greenwich. The materials used were as follows:—For the facings, Lawrence's red bricks and Portland stone; for the flat roofs and domes, concrete and asphalt; and for the main roof, Tilberthwaite slates. Messrs. Henry Hope and Sons supplied the iron casements and glass for the building.


BRANCH LIBRARY GREENWICH
FRONT ELEVATION
SECTION C.D.
LONGITVDINAL SECTION
FEET
Wills & Anderson Archts
24 Bloomsbury Square
London W.C.



BRANCH LIBRARY, GREENWICH: DETAILS OF FITTINGS. WILLS AND ANDERSON, ARCHITECTS.


BRANCH LIBRARY GREENWICH
DETAILS of FITTINGS in NEWS ROOM
& REFERENCE LIBRARY
inches 12 FEET
TABLES for NEWS Rm & REFERENCE Rm
½" SCALE
umbrella rack
END ELEVtn
SECTION
STAND between Columns next Entrance SECTION
½ Scale
WALL STANDS SECTION
ELEVtn
½ PLAN at Table Level
1" Scale
½ PLAN below top
STAND between COLUMNS next ENTRANCE
½ FRONT ELEVtn
ELEVtn 1" Scale
RACK in REFERENCE LIBRARY
½ BACK ELEVtn
ELEVtn 1" Scale
ELEVtn ½" Scale
SECTION MAGAZINE RACKS in NEWS Rm
SECTION
1" Scale
Wills & Anderson Archts
24 Bloomsbury Square
London WC
BOOKCASE for CENTRAL LIBRARY
ELEVATION
SECTION
½" Scale

Views and Reviews.

(Continued from page 70.)

Theoretical and Practical Hydraulics.

Professor Unwin, in writing on hydraulics, has not taken up a subject new to him. In the early sixties he was engaged in designing water turbines and centrifugal pumps; in 1876 he wrote the article "Hydraulics" for the Encyclopædia Britannica; and on many occasions he has had to consider questions of the flow of sewage and measurement of water. His book will be found of great value to engineers, for whom it is primarily intended, and we have no doubt it will be regarded as one of the few real text-books on the subject. It provides the theoretical equipment for an engineer; it does not deal with the practice of water engineering—for that, other works must be consulted. This limitation of the subject is valuable, for firstly, it keeps the volume a handy size, and secondly, the student who has mastered this work will be more competent to study practical examples, and to glean the utmost knowledge from them, than one who has endeavoured to combine the study of the two branches at once.

"A Treatise on Hydraulics," By William Cawthorne Unwin, L.L.D., F.R.S., M.I.C.E., Emeritus Professor of the Central Technical College, etc. London: Adam and Charles Black, 4, Soho Square. Price 12s. 6d. nett.

The second work under review is a book of tables and diagrams which enable the size of a pipe, drain or sewer to be quickly and easily ascertained, as also the cost. By their aid, if the total length and levels of a long line of conduit pipes to provide different discharges are known, the required sizes of the different pipes can be at once ascertained; also sizes of drains and sewers can be ascertained from the falls in their water surfaces. A most useful compilation.

"Practical Hydraulic (Water-Supply and Drainage) Tables and Diagrams." By C. E. Housden Superintending Engineer P.W.D., India. London: Longmans, Green and Co., 39, Paternoster Row E.C. Price 3s. 6d.

While Professor Unwin, in the treatise referred to above, deals with the theoretical aspect of water engineering, Mr. W. G. Bligh in his work deals with a branch of practice, namely, irrigation works. This subject comprises the design of retaining walls, dams, weirs, piers, arches, abutments and floors, canal works, reservoirs, tanks, etc. The author has had considerable practical experience, and we are pleased to welcome the work as a most valuable text-book, one that should serve for many years to come as a standard guide to students of this branch of water engineering.

"The Practical Design of Irrigation Works," by W. G. Bligh, M.I.C.E., Executive Engineer, Indian P.W. Department (retired). London: Archibald Constable and Co., Ltd., 10, Orange Street, Leicester Square, W.C. Price 21s. nett.

Brickwork and Masonry.

We have already reviewed the "Carpenters' and Woodworkers' edition" of the Building Mechanics' Ready Reference." The present "Stone and Brick Masons' edition" follows on much the same lines; it is a handbook for the working craftsman, in a convenient form, conveying a great deal of practical information in a small compass. It is much more serviceable than books catering for a similar class of reader produced in this country, and though dealing in great part with American practice will be useful to English workers.

"The Building Mechanics' Ready Reference: Stone and Brick Masons' edition." By H. G. Richey, Superintendent of Construction, U.S. Public Buildings. London: Chapman and Hall, Ltd. Price 6s. nett.

Notes on Competitions.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.		COMPETITION.
Feb.	1	BRANCH BATHS AT ROCHDALE (to cost £7,500).—Premiums £25, £15 and £10. Assessor will be appointed. Conditions from S. S. Platt, Borough Surveyor, Rochdale. Deposit 10s. 6d.
Feb.	1	SECONDARY SCHOOL FOR BOYS AT MAIDENHEAD.—Premiums £100, £50 and £25. Assessor to be nominated by President of R.I.B.A. Conditions from the Secretary, Berkshire Education Committee, The Forbury, Reading. Deposit 5s. Summary in BUILDERS' JOURNAL, December 11th.
Feb.	1	CITY HALL AT PERTH.—To cost £25,000. Premiums £50, £30 and £20. J. J. Burnet, A.R.S.A., F.R.I.B.A., Assessor. Deposit, One Guinea.
Feb.	15	MUNICIPAL BUILDINGS AT SHANGHAI. — Conditions, together with site plan, may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.
Feb.	17	NEW COUNCIL OFFICES, &c., AT RADCLIFFE.—Limited to architects in Lancashire. Assessor, Mr. G. H. Willoughby, F.R.I.B.A. Premiums £75, £50, and £25. Conditions from S. Mills, clerk, Council Offices, Radcliffe, Manchester.
Mar.	7	SECONDARY SCHOOL AT LOWESTOFT.—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft. Deposit, 5s.
April	28	ADMINISTRATION OFFICES AT PONTYPRIDD, for the Guardians.—Conditions from William Spickett. Clerk, Union Offices, Pontypridd, on or before January 31. Deposit £2 2s.
May	31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.

Acton Municipal Offices.

A special meeting of the Acton District Council was held on Friday evening last, to further consider the steps to be taken in connection with the selection of a design for the erection of new municipal buildings. The Chairman (Mr. H. S. Schultess-Young) said the Council were awarding the premiums, and they had stipulated that before any design was selected or any prize awarded they must be satisfied that the work could be carried out at a cost of £18,000. He had on paper the different prices which had been mentioned by the architects themselves as to the cost of their designs. The highest came to £25,000, and the lowest to £16,000, but the latter was not a scheme which came within the assessor's commendation, or, rather, not within the first three. But whether high or low the price by both these architects worked out at 8½d. per cub. ft., and the design placed first by the assessor was at 9d. Personally, he thought they ought to attach the greatest weight to the assessor's opinion. Mr. Norman Shaw came to them at a time when they certainly needed assistance. He had selected three designs for premiums, and it was for the Council to consider whether they came within their rules and conditions or not. Design No. 34 placed third by the assessor, he did not think came within the conditions, for the reason that the competitor had violated the rule as to site by providing for the future. town hall in Winchester Street. Then as regards No. 26, placed first, it seemed to him that that also was not likely to be a design to be erected at £18,000, though he quite thought the author should be given an opportunity of showing if he could do so. It was only priced at 9d. per cubic foot, but even then the foundations had not been taken into consideration, and, in addition, Mr. Norman Shaw suggested a great many alterations that would be necessary. That brought him to design No. 6, placed second. It seemed to him that that was a plain design, and, everything being at right angles, it also appeared that it would be a very inexpensive design to carry out. At any rate, everything shown appeared to be very straightforward. He should say himself, not being an expert, that if No. 1 could be carried out for anything like 9d. so ought No. 2, which at that price, including foundations, came to £16,488, thereby allowing an opportunity for charging 9½d. if found necessary. He would say no more than that the acceptance of that design (No. 6) appeared to be a very happy method of getting over the difficulties. He therefore proposed that design No. 6 be accepted, and that Nos. 26 and 6 be awarded premiums, and that having regard to the violation of the rule as regards site, Mr. Norman Shaw be requested to select another design for third place. A long discussion ensued, in the course of which Councillor Ince said: "Has the surveyor any evidence to offer as to what would be the cost of design No. 6, placed second?" The Surveyor: "I have only cubical evidence. Personally, I am sure it can't be done satisfactorily under 11d. At 10d. it might perhaps be possible to get it done, and the cost would be about £22,000. As to No. 26 I say absolutely that that could not be done under 11d." Councillor Baldwin: "Could it be done for 1s. or 1s. 2d.?" The Surveyor: "It might, perhaps, be done for 1s. with great economy." Councillor Boissonnade: "Then the surveyor's evidence is that design No. 6 will cost £22,000?" The Chairman did not agree with the surveyor's method in arriving at that estimate. Eventually the matter was left as on the resolution of the former meeting, namely, to await the surveyor's report on the designs placed first, second, and third by the assessor.

Secondary School, Sowerby Bridge.

A meeting of the Sowerby Bridge Secondary School Governors was held last week to decide on the plans submitted for the proposed new school. Twenty-eight designs were sent in. These were reduced to three, and finally the design by Messrs. Longbottom and Culpan was selected.

Municipal Buildings, Bournemouth.

The Municipal Buildings Committee are recommending the Bournemouth Town Council to hark back to the position of 1900, and to invite competitive plans for the erection of buildings at a cost not to exceed £80,000. It will be recollected that a competition was held some years ago in which the design by Mr. C. E. Mallows and Mr. F. W. Lacey (borough surveyor) was selected. Apparently that scheme is now to be discarded.

Y.M.C.A. Building, Manchester.

The Rebuilding Fund Committee of the Manchester Young Men's Christian Association decided some months ago to invite four firms of architects in Manchester to submit designs for the new premises which it is intended shall replace the existing buildings in Peter Street. Mr. Thomas Worthington, F.R.I.B.A., was appointed assessor, and it is now announced that on his recommendation, and with the approval of the Management Committee, the Rebuilding Committee has unanimously selected the design of Messrs. Woodhouse, Corbett and Dean. The designs are now on view at the Association Rooms, in Peter Street. The estimated cost of the new premises, including equipment, is

£40,000. Towards this amount about £22,000 has already been subscribed. Included in the plans are a large hall, capable of seating 1,100 persons, and a minor hall accommodating 170 persons. There will be a library and reading-room, many classrooms, a cafe, smoke-room, billiard-room, a gymnasium with a running track of twenty-four laps to the mile, a swimming bath, 75ft. by 23ft., five courts on the roof, and ample accommodation for the junior section, which is rapidly becoming an important department in the work of the Association.

Law Case.

Newcastle Royal Infirmary: Claim in Respect of the Asphalting Contract.

On January 14th, in the King's Bench Division of the High Court of Justice, Mr. Justice Jelf heard the case brought by the Val de Travers Asphalte Paving Co., Ltd., of London, against Peter and Jane Rule, executors of the late John Leitch Rule, of Sunderland. Mr. Foote, K.C., for the plaintiffs, said the action was brought to recover £671 9s. 6d., balance due under a contract for certain asphalting work executed by the plaintiff company for the deceased Rule. The defence relied upon arose out of the contract for the erection of Newcastle Infirmary in 1903. The principal contractor for the erection of the infirmary was Mr. Alexander Pringle, and the contract altogether involved a sum of about £203,000. Pringle entered into a sub-contract with the deceased Rule, who was to do the plastering and asphalting. The amount of the sub-contract was about £20,000. When Rule came to do the work he found that the contract specified that Val de Travers asphalt was to be used. He approached the plaintiff company, and employed them to do the asphalting work. The defence set up by Rule's executors was that, although they did not dispute that the work was done, nor complain of the quality or the price, they said that under the contract the plaintiffs were bound to wait for payment until the defendants got payment from the building-owners or from the principal contractor. The defendants further said that the terms and conditions of Rule's contract with Pringle were incorporated with the contract between Rule and the plaintiff company, and that the plaintiffs were bound to submit to certain terms with regard to retention money. The main question to be decided was whether upon the correspondence there was any such incorporation of the conditions, which, no doubt, existed as between Pringle and the building-owners. Counsel added that, so far as he was acquainted with the facts, he could not see that there was any such contract between Pringle and Rule. The contract between Pringle and Rule was never drawn up, and was only contained in a letter showing that Rule should be employed by Pringle. He (counsel) urged that the provision as to retention money in the main contract did not apply as between the plaintiffs and the defendants, and that there was never any agreement for the plaintiffs to wait for their payments until certificates were given by the architect or clerk of the works.—Mr. Edward Bassett, manager of the plaintiff company, stated that he never had any dispute as to the charges which were made nor as to the quality of the work. The only question involved was as to the time they should be paid for the work. It was alleged that the plaintiffs could not be paid until the work was certified for. Mr. Cooper, of the plaintiff company, said that it was the practice to pay as the work proceeded.—No evidence was called for the defence.—His lordship said that there was no incorporation of the conditions of the original contract in the sub-contract between the plaintiffs and defendant. He gave judgment in favour of the plaintiffs for the full amount claimed, with costs. —His Lordship refused a stay of execution.

Panel over Entrance.

Terra-Cotta Detail on Wall.

DETAILS FROM NEW SCHOOLS IN BERLIN. LUDWIG HOFFMANN, ARCHITECT.

A HUMORIST IN STONE.

Humour never needs an explanation: it speaks for itself. We need not, therefore, go into any lengthy comment on or description of the details from two new schools in Berlin which we publish on this page. The old Gothic builders had a quaint fancy for the grotesque, but that element has long since gone out of our work. Here, however, is a German architect of to-day with the same playful touch. The details are only trifling, but we think they add a little personal interest which is most welcome, and without wishing to advocate the bespattering of our schools and other buildings with stone translations from the Comic Press, we feel sure that some measure of the humorous fancy which Ludwig Hoffmann possesses would be a refreshing change from the stock details in which unimaginative architects take constant refuge.

Correspondence.

Taxes and the Building Trade.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—The building trade is the second largest in the country. The products of its industry are rated to the full and carry practically all the taxes for local purposes, such as the poor law, street cleansing, drainage, etc. How does it happen that during the past year of Booming trade ours should have been so quiet? Is it not high time that we, as builders, from the humblest labourer to the highest architect or master-builder, join hands and say that we will not have the work of our

hands and brains taxed in this manner. No wonder that people hesitate so long before re-building their old premises, enlarge or improve workshops, have commodious houses, etc., when they know that as soon as their plans are presented to the authorities, machinery is put in motion to exact an annual tax for such rash conduct. The Scottish people are trying to get taxes put on land only. Mr. Chiozza Money, the eminent economist, seems to think an income tax would be better. Both appear to be feasible enough, but by all means let us forget such trivialities as official registration, etc., and combine to rid ourselves of this handicap, which no other trade suffers from.

Yours truly,

MOORE AND CRABTREE.

Keighley.

R.I.B.A.

A meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., the chair being occupied by Mr. T. E. Collcutt, president.

The decease was announced of Mr. John Salmon Quilter, F.R.I.B.A., past-president of the Architectural Association, and of Mr. Francis Edward Morris, A.R.I.B.A.

Royal Palaces in Scotland.

A paper on "Royal Palaces in Scotland" was then read by Mr. W. T. Oldrieve, F.S.A.Scot., F.R.I.B.A., Principal Architect to H.M. Office of Works, Scotland.

Mr. Oldrieve said that there were remains of about twenty royal palaces in Scotland. Most of them were in ruins, but all were of great interest historically, and some of them of much interest architecturally. So large a number of royal dwellings was doubtless due to the restless and divided political state of Scotland during the period when the earlier royal castles were built, i.e., between 1200 and 1500. The mountainous nature of the country and the consequent difficulty of communication probably also led to the multiplication of royal palaces, while the earlier royal residences, being also fortresses, were needed at strategic points of the divided kingdom. The sites for the buildings appear to have been chosen with considerable discrimination, both strategically where this was necessary, and with regard to the picturesque. Buildings having little or no architectural embellishments harmonise most successfully with the natural features of the surrounding country; instead of being a blot on some glorious mountain scene the general impression frequently is wholly a delight. The suitability of the materials and the manner of their employment in the buildings still bear testimony, even in decay, to the artistic capacity of their designers. Where choice was possible the stone used seems to have been the most suitable to give harmony of colour in the general landscape. The earlier castles were generally of the type of the Norman keep, something similar to those of France and England. Unfortunately Scottish buildings of the earlier period have suffered even worse than those of England through the desperate feuds of the clans or during the wars of more serious import; hence there are no remains of residential buildings of the character under consideration earlier than the 13th century. As the Scottish throne became more secure, the royal palaces developed from the simpler type of the keep to the more extensive and elegant type of palace, as represented by Stirling, Linlithgow, Holyrood, and Falkland.

The author prefaced his description of the buildings by a list of Masons of the Crown of Scotland appointed under the Privy Seal, beginning with the grant by James V. in 1532 to John Brownhill of the office of Master Mason for life. From 1536 to 1557 the office was held by three Frenchmen in succession. The last appointment was by the Prince Regent in 1819.

The author gave a general survey of the buildings in the following order:—

Roxburgh Castle, now in ruins, which was a royal castle in the 12th century.

Traquair House, Peebleshire.—David I. (1124-1153) and several of his successors all date charters from this house. The building is of three periods, the latest additions being in 1695.

Rothesay Castle, in the island of Bute. One of the most interesting of the early royal castles, said to have been erected in the period of the Norse invasion. It was a favourite residence of Robert II. and Robert III. in the 14th century.

Kildrummie Castle, which stands on an eminence near the river Don, about thirty miles west of Aberdeen, has long been in ruins; it is doubtless one of the 13th-century castles.

Dunstaffnage Castle stands on a jutting rock, near the point of a low-lying peninsula at the seaward end of Loch Etive in Argyllshire. The original castle is supposed to date about 1250; the later buildings probably date partly from the 16th or 17th century, and partly from the 18th.

Lochmaben Castle, in Dumfriesshire, now in ruins, is believed to have been built by Robert Bruce, who died there in 1295.

The Palace of Dunfermline is connected with the Abbey by a tower. The oldest part appears to date from the Transition period from Norman to Early English. The abbey was restored by King Robert Bruce and the palace built.

Dundonald Castle is a good example of a fourteenth-century keep.

Linlithgow Palace stands on the site of a royal castle. The building of the present palace commenced in the year 1425 under John of Walton, Master of Works. James V. was born there in 1512. He considerably altered the buildings. It was set fire to after the battle of Falkirk.

Edinburgh Castle was for the first time designated in history as a royal residence in the reign of David I. (1124). The little Norman chapel to Queen Margaret still exists: it is the oldest building of the castle group, and one of the oldest in Scotland. During the reign of Alexander III. it became the principal royal residence in Scotland. Edward III. refortified the castle, and in 1334 it formed one of a chain of fortresses intended to hold the south of Scotland in subjection. The great hall was built in 1434.

Stirling Castle was a special favourite home of the royal Stuarts, James I. of Scotland regarded it as the Windsor of Scotland. The palace building is particularly interesting as one of the earliest examples of the Renaissance in Scotland. The royal chapel was erected by James VI. in 1594.

Falkland Palace is known in history as far back as 1371; but the main building would appear to be of the latter part of the fifteenth or early sixteenth century. James V. and James VI. added considerably to the building.

It is well authenticated that James IV. built the royal palace of Holyrood, and it is believed that the work was begun in 1498. The later Palace of Charles II. was commenced in 1671. Unfortunately the erection of the palace as now seen involved the demolition not only of the older palace and monastic buildings, but the south-west tower of the abbey church. Only the great tower opposite the main approach by the Canongate was spared, and this feature really governed the design of the principal front. The new palace was built on a very much more extensive scale than that which had previously occupied the site. It is rectangular in plan.

Prizes and Studentships for 1907-8.

The deed of award of prizes and studentships for 1907-8 was announced. The following is the list of awards:

Essay Medal and 25 *guineas.*—Subject: "The Function of Colour in Street Architecture." This prize was not awarded, but a medal of merit was granted to Percy Montague Stratton, of Upper Mitcham, Surrey ("West Wind"), and a certificate of hon. mention to Henry H. Hill, B.A., of Cork ("Arbor Vitæ"). Four essays submitted.

Measured Drawings Silver Medal and 10 *guineas.*—Leslie Wilkinson, of Ealing (No. 11, "Sanmicheli). Certificate and 5 guineas to Maurice Lyon, of London (No. 12, "Sanmicheli"). The deed of award also granted a certificate of hon. mention to the author of the set of drawings bearing the motto "Cantii," but as it was found that this had been submitted (contrary to regulations) by two persons, namely, Robert Tall and Thorold Bennett, of Gravesend, the president reserved the matter for the consideration of the Council. Fifteen sets submitted.

Soane Medallion and £100 (for Continental travel).—Subject: "Design for a Custom House on a Quay." George Drysdale, of Rothbury, Northumberland ("Free Trade"). Certificate and 5 guineas each to Adrian Berrington, of Birkenhead ("Fabulosus") and Robert Russell Prentice, of Thornton, Fife ("Hang! I've forgotten the motto!"). Twenty-eight designs submitted.

Owen Jones Studentship: Certificate and £100 (for travel, and study of colour). —A. E. Martin, of London, S.W. Three sets of drawings submitted.

Pugin Studentship: Silver Medal and £40 (for travel in the United Kingdom).—Sidney G. Follett. Certificate and 5 guineas to A. Winter Rose, and a certificate of hon. mention to N. W. Hadwen. Twelve sets of drawings submitted.

Tite Prize: Certificate and £30 (for travel in Italy).—Subject: "An Open-air Theatre." George Drysdale, of Rothbury, Northumberland ("Yours Truly"). Certificate and 10 guineas to Anthony R. Barker, of Harrow ("Balbus"); and certificates of hon. mention to T. L. Vesper, of Beckenham ("Dombey") and Alan Binning, of Blackheath ("Panjandrum"). Fourteen designs submitted.

Arthur Cates Prize (40 guineas).—Bryan Watson. This was the only set submitted.

Grissell Gold Medal and 10 *guineas.*—Subject: "Design for an Elevated Water Tank in Reinforced Concrete." John H. Markham, of London ("A.B.C."). Nine designs submitted.

Godwin Bursary: Silver Medal and £65. A. Halcron Verstage. Three sets submitted.

Henry Saxon Snell Prize: £60 (hospital design and construction). W. Milburn, junr. Six sets submitted.

The Ashpitel Prize was awarded to J. C. Proctor, of Leeds.

Notes and News.

MONSIEUR J. GAUDET has been elected president of the Société Centrale des Architects Francais.

* * *

MR. SYDNEY PERKS, F.R.I.B.A., surveyor to the City Corporation, has been elected a Fellow of the Society of Antiquaries.

* * *

THE COLUMBIAN FIREPROOFING CO., LTD., of 37, King William Street, London, E.C., have appointed Mr. F. W. Nicholson as their new manager.

* * *

CHANGE OF ADDRESS.—Mr. Bertie Crewe, architect, has removed from Savoy Mansions to 75-77, Shaftesbury Avenue, W.C. Telephone, 4166 Gerrard.

* * *

A USEFUL CALENDAR, with clear well-printed letters, has been sent to us by Messrs. John Jones (Chelsea) Ltd., manufacturing sanitary engineers, of Carlyle Works, Chelsea.

* * *

THE DIGBETH INSTITUTE at Birmingham was opened on Thursday last. Mr. Arthur Harrison, F.R.I.B.A., was the architect. A full description of the building was given in our Birmingham issue, published on October 2nd last year.

* * *

A NEW BANK FOR MANCHESTER.—At the corner of Brown Street and Norfolk Street, Manchester, a new building for the Palatial Bank is proposed to be erected. Messrs. Briggs, Wolstenholme and Thornely, FFF.R.I.B.A., of Liverpool, are the architects.

* * *

THE NEW ALBERT HALL, NOTTINGHAM.—This new building, to be erected on a site off Derby Road, will cost £17,000. It will be larger than the former building, which was burnt down nearly two years ago. Accommodation will be provided for 3,000 people. Mr. A. E. Lambert, of Nottingham, is the architect.

* * *

THE EXCAVATIONS AT HERCULANEUM will be directed by a special commission which has been appointed. The work done and the discoveries made will be recorded from time to time in official publications, for the benefit of home and foreign students and scholars.

* * *

L.C.C. CAMBERWELL SCHOOL OF ARTS AND CRAFTS (PECKHAM ROAD S.E.).—The annual exhibition of the works of the students attending this school and its affiliated centres was opened yesterday, and will remain open until January 31st from 2 to 10 p.m. each day. Thorough instruction in all the crafts related to building is given at the school.

* * *

THE OPENING OF LAMBETH'S NEW MUNICIPAL BUILDINGS by the Prince of Wales has been postponed. The inaugural ceremony was to have taken place next month; but, owing to some delay in completing the internal work of the structure, it has been decided to change the date, and the opening will not now take place before the end of March or the beginning of April.

* * *

A NEW STATION FOR NORTHALLERTON.—The directors of the North-Eastern Railway Co. contemplate proceeding early in the spring with the erection of a much-needed new railway passenger station at Northallerton. The plans have been settled, and very shortly tenders will be invited for the execution of the work, which, it is estimated, will cost about £17,000. The site is stated to be at Romanby Grange, which is about 150 yds. south of the present station.

* * *

BORDEAUX MARITIME EXHIBITION, 1907.—The list of awards in connection with this exhibition, held last summer, has now been issued. Amongst the successful exhibitors are Messrs. Wailes, Dove and Co. (1906), Ltd., of Newcastle-on-Tyne, who have been awarded a gold medal and diploma for their exhibit of models of ship and iron buildings coated with their patent "Bitumastic" specialities. Messrs. Wailes, Dove and Co. also gained a gold medal at the Milan International Exhibition for the excellence of their specialities.

* * *

LEEDS AND YORKSHIRE ARCHITECTURAL SOCIETY.—At last Thursday's meeting of this Society, Mr. G. J. Coombs, A.R.C.A., read a paper on "Christchurch Priory, Hampshire." In the course of his remarks Mr. Coombs said that the crypts under the transepts and presbytery probably belonged to the original Saxon church, the legend being that Flambard destroyed the Saxon church to erect his building on the same foundations. The monastery was dissolved in 1536, after which the church was granted to the parish as the parish church, and that might account for its preservation. In the 19th century much restoration was carried out: the nave was vaulted in stucco on wooden framing about 1819, and restoration was proceeding at the present time.

* * *

THE DEVELOPMENT OF ENGLISH MEDIEVAL ARCHITECTURE.— In connection with the Leeds University Extension work, a course of four lectures on the "Development of Medieval Architecture in England" has been arranged for four Thursday afternoons in February, beginning on the 6th. The lectures will be given by Mr. John Bilson, F.S.A., F.R.I.B.A., in the Philosophical Hall, and will be illustrated by lantern slides and models. Three of the lectures will deal with the development of English architecture from the Norman Conquest to the end of the fifteenth century, and the fourth will be concerned with the English parish churches. On Saturday, February 29th, a visit will be paid to Kirkstall Abbey, the architecture of which will be described by Mr. Bilson.

* * *

GLOUCESTERSHIRE ARCHITECTURAL ASSOCIATION.—The first annual general meetting of this Association was held on Thursday evening last. The president, Mr. F. W. Waller, read the council's annual report for 1907, and congratulated the members on the amount of work accomplished in the first year of the Association's existence: he also called attention to the satisfactory financial statement. The report was adopted, and several matters of interest to the Association were discussed, after which the election of officers for 1908 was proceeded with, as follows:—President, Mr. F. W. Waller; vice-presidents, Messrs. M. H. Medland and H. W. Chatters; council, Messrs. W. B. Wood, H. A. Dancey, and T. Malvern; hon. secretary for Stroud, Mr. G. P. Milnes; hon. secretary for Gloucester, Mr. J. F. Trew; hon. general secretary, Mr. T. Overbury.

* * *

WINCHFIELD PARISH CHURCH, HANTS, dating from early Norman times, and well-known to archæologists for its beautiful and unique chancel arch, has recently been restored under the direction of Mr. T. E. Collcutt, P.R.I.B.A. The work includes new roofs to the tower, nave, porch and chancel and the removal of the angle columns at the four corners of the tower: these columns were inserted about 60 years ago, and, although intended as ornaments, were quite out of harmony with the old Norman tower, which, moreover, they weakened to a considerable extent: they have now been replaced by square corners, as in the original design. The porch, which was found to have subsided and become detached from the church, has been forced back to its original position secured by several ties, and bonded into the walls. The restoration work has been carried out by Messrs. Pool and Sons. The cost has been defrayed by Mr. Spencer Charrington.

* * *

NORTHERN ARCHITECTURAL ASSOCIATION. A meeting of this association was held on Wednesday last, the President, Mr. A. B. Plummer, F.R.I.B.A., presiding. In the absence of Mr. Moritz Kahn, Mr. de Colleville chief engineer of the Trussed Concrete Steel Co., Ltd., delivered a lecture on reinforced concrete building construction. In the course of the lecture, which was illustrated by lantern slides, Mr. de Colleville showed how various stresses were best resisted, and dwelt upon the principles of design, selection of materials, the mixing and handling of concrete, and some causes of failure. The lecturer stated that reinforced concrete did not lend itself to elaborate architectural treatment and would probably be little used for such work on account of its cost. During the discussion which followed, it was mentioned that reinforced concrete was first invented in Newcastle, Wilkinson's system (consisting of wire ropes in concrete floors, having been patented in 1854.

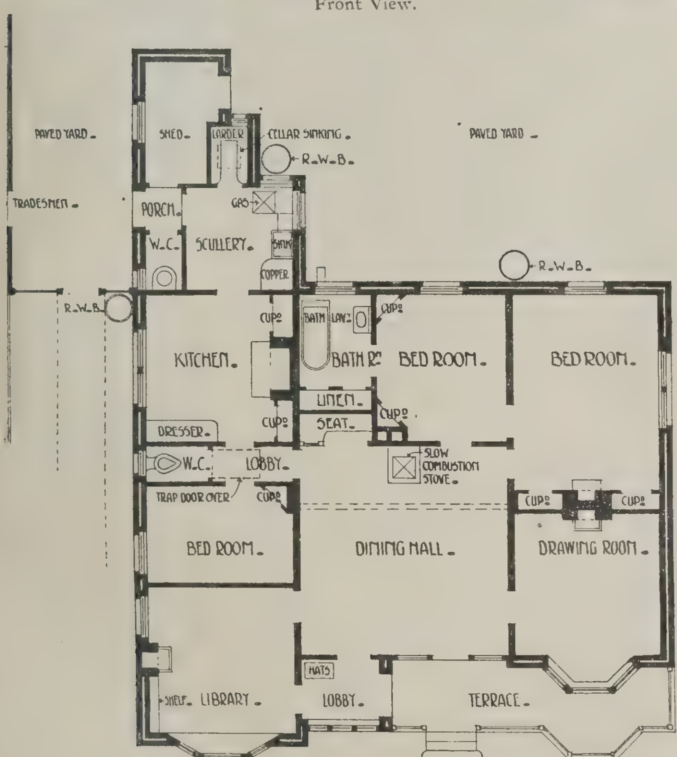
* * *

SAXON CEMENT CO: STAFF DINNER.—A staff dinner of the Saxon and Norman Cement Cos. was held on January 13th. The chair was taken by Mr. A. C. Davis, managing director of the Saxon and Norman companies and chairman of the Atlas Stone Co. Mr. F. W. Davis, the managing director of the Atlas Stone Co., was unfortunately prevented from being present through illness. Supporting the chairman were Mr. Henry Turvey (secretary of the Norman Co.), Mr. H. C. Apthorpe (secretary of the Saxon Co.), Mr. Worwood (works manager of the Norman Co.), Mr. Warsap (works manager of the Saxon Co.), and Mr. C. F. Cooper, M.I.C.E. (engineer to the companies). In the course of the toasts, Mr. A. C. Davis said he thought it was unnecessary for him to say that in Saxon cement they had struck the right nail on the head. Let them drive it in firm with all their strength, so that it might never be infirm. Some six years ago, when the Saxon works started running, they were turning out 500 tons a week. Now the output was some 2,000 tons, and they had a staff of about 400 men, while they paid away in wages alone £33,000 every year. The results of their labours had met with a success second to none in the cement trade, and there was no one who could beat them, because there was no one who could get together a better staff of workers than they had in their three companies. "May we keep up that record," said Mr. Davis, in conclusion.

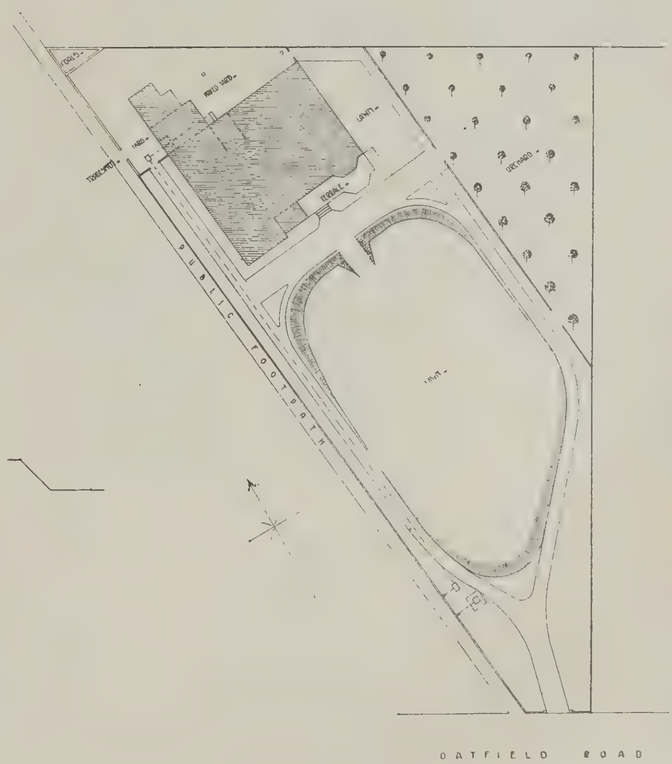
Front View.

Side Elevation.

Rear Elevation.



Ground-Floor Plan.



Site Plan.

"FAHEIM," OATFIELD ROAD, ORPINGTON. FR. RINGS, ARCHITECT.

CHARGES FOR SPECIALISTS' SERVICES.

In England it is the exception, rather than the rule, for an architect to prepare the details of any constructional engineering that may be required in his buildings, whereas architects in America, owing, possibly, to the superiority of their scientific knowledge, frequently make their own constructional steel drawings. This fact probably accounts for the omission of any mention of the constructional engineer in the following clause, relative to expert assistance, that appears in the Schedule of Charges issued by the American Institute of Architects, viz: "Where heating, ventilating, mechanical, electrical, and sanitary problems in a building are of such nature as to require the assistance of a specialist, the owner is to pay for such assistance. Chemical and mechanical tests, when required, shall be paid for by the owner." Although this clause is to remain unaltered, the Committee which has recently reviewed the whole question of the charges of architects makes the following remarks thereon:—"The practice of charging for experts' services scarcely exists except in the larger cities of the East. In fact, experts seem to be rarely employed elsewhere. There is no doubt about the need and value of experts' services, as the client is greatly benefited thereby, to the economy of construction and operation. The architect's duties are not diminished by the employment of an expert—in some cases they are increased; the architect is therefore entitled to his usual compensation in addition to the expert's fee." Architects who have had large building works under their control will agree with the Committee of the American Institute of Architects that their duties and responsibilities are often *increased*, and very seldom *decreased*, by the employment of expert specialists, whose services however are sometimes indispensable. This being the case, the fact should be recognised in England, as it already is in America, and the payment of specialists' fees should be provided for in the R.I.B.A. Schedule of Charges.

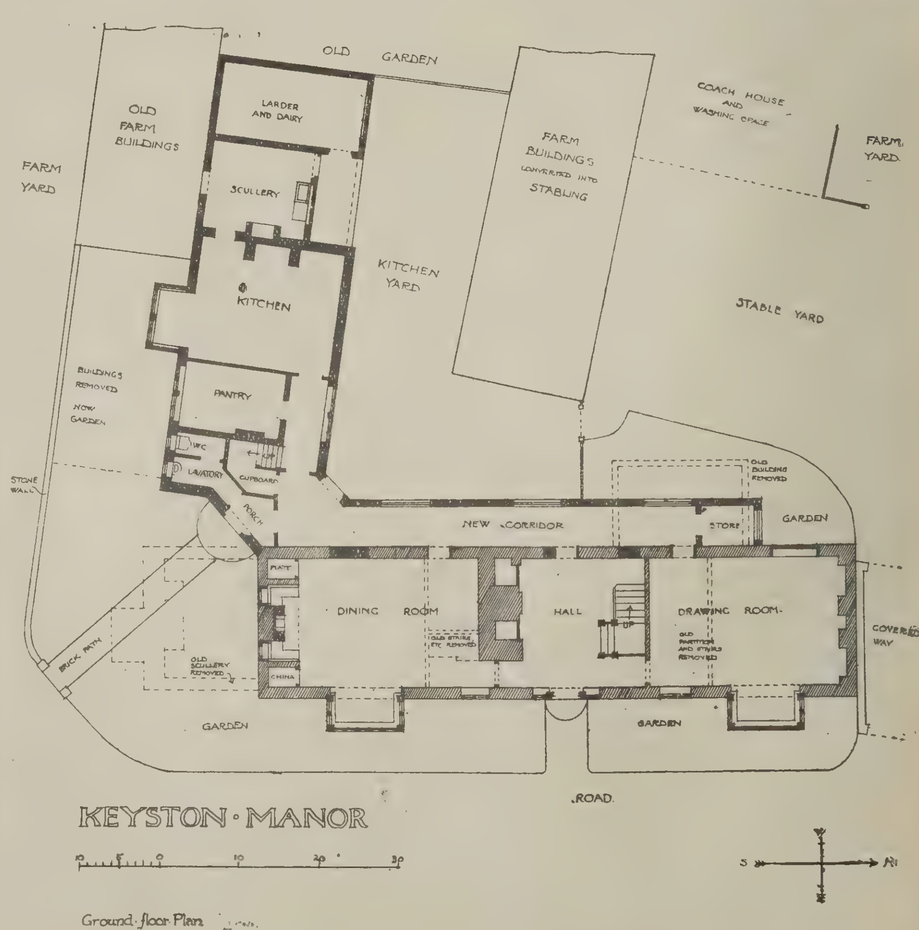
HOUSE AT ORPINGTON.

The house at Orpington illustrated on this page is built with two $4\frac{1}{2}$in. brick walls and a $2\frac{1}{4}$in. air-space between, the outside being rough-cast. The roof is covered with Somerset interlocking tiles. The accompanying plan shows the disposition of the rooms. The dining hall is 17ft. square, and the slow-combustion stove fitted in it practically heats the whole house: it was supplied by the London Warming and Ventilating Co. Louvre shutters are provided to the bedrooms, so that the upper sashes can be let down to secure a current of air without downdraught; most of the rooms are ventilated also by iron gratings, leading to specially built air-flues, at the side of the smoke flues. The w.c. is fitted with a "Health" closet, supplied by Messrs. Doulton and Co., Ltd. The builder was Mr. S. J. Howick, of Catford, S.E. A piece of land is reserved on the east side for future extension, where two more bedrooms can be added, approached by a passage which would be taken off the largest bedroom.

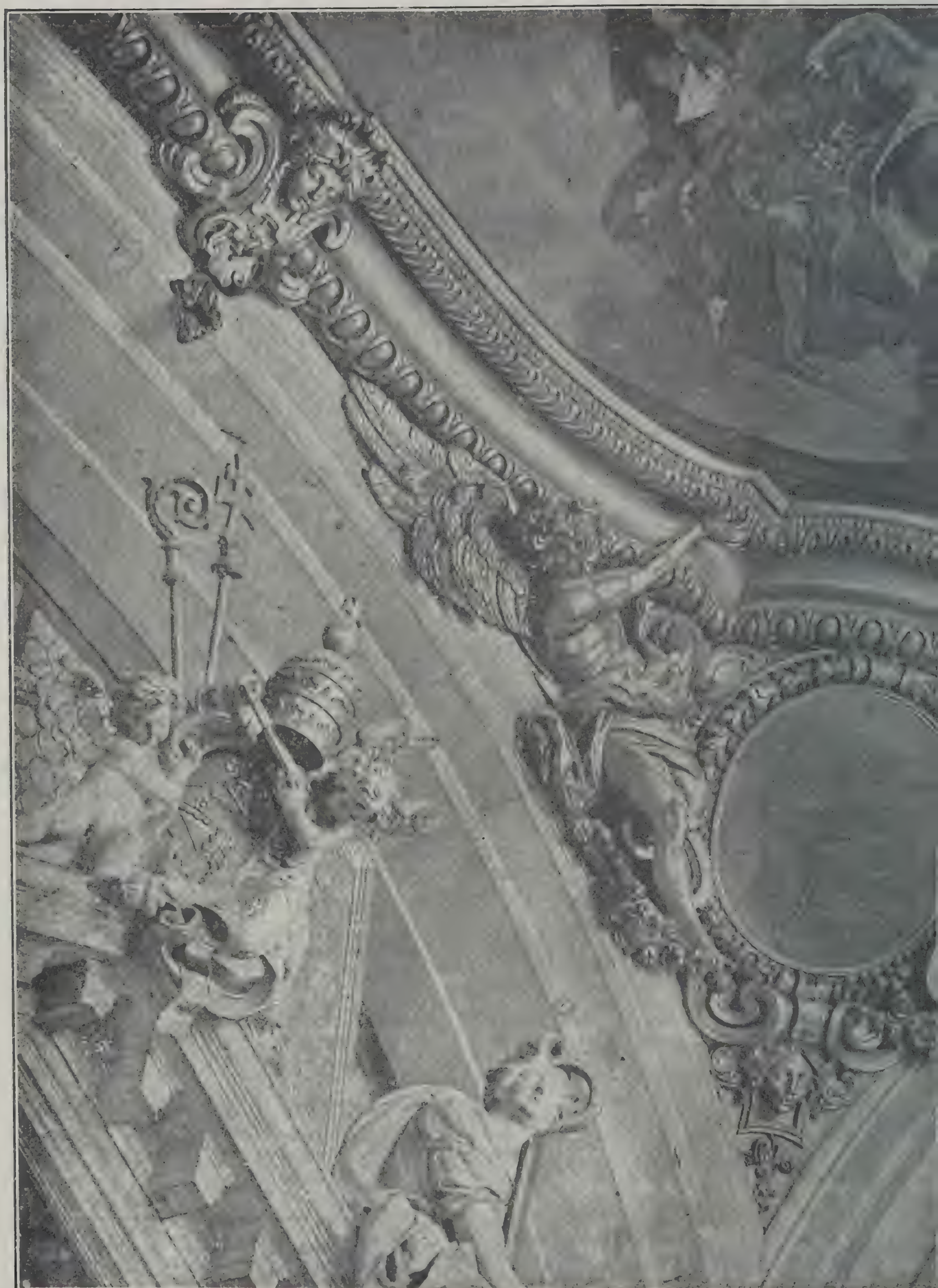
KEYSTON MANOR.

This old farm-house, which is about to be remodelled as shown by the accompanying perspective and plan, is situated by a quiet roadside in the little village of Keyston, on the borders of Huntingdonshire and Northamptonshire. Across the road lies a large and pleasant garden, and behind the house are the buildings of a large farm. The house consists of two old cottages thrown into one, built of still older materials a hundred years ago on the site of a demolished manor-house. The owner wishes to retain as much as possible of the existing house, which is between his farm and garden, but to remodel it to suit modern requirements, without a large outlay. A reference to the plan will show how this is arranged to be done. The walls blacked in solid indicate the new work, and those hatched the old work. The new wing faces south, and a sunny billiard-room is arranged on the first floor over the kitchen and pantry. There are also five bedrooms and a bathroom on this floor, and two attic bedrooms with a box-room above. A good deal of the surrounding outbuildings at the back is being removed to give light and air to the new wing, though the very cramped nature of the site prevents an ideal plan. The architect is Mr. Martin Shaw Briggs, A.R.I.B.A., of 11, Porchester Place, Hyde Park, W., and Otley. The perspective we publish is his own work.

ERRATUM.—A printer's error occurred in the description of Gibbs's design for King's College, Cambridge, on p. 42 of our issue for last week. The size of the projected quadrangle was given as 282ft. by 24ft. instead of 282ft. by 240ft.



MARTIN SHAW BRIGGS, A.R.I.B.A., ARCHITECT.



A PORTION OF THE CEILING IN THE CHAPEL OF S. DON

O IN THE CHURCH OF SS. GIOVANNI E PAOLO, VENICE.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 364, Westminster.

Date of Publication: The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is published every Wednesday, price 2d.

The "Concrete and Steel Section," is given in this Issue.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

An Architectural Injustice.

As we announced last week, the Municipal Buildings Committee of the Bournemouth Corporation has reported in favour of instituting an open competition for the erection of new buildings at a cost not to exceed the sum of £80,000. Many of our readers are aware that Mr. C. E. Mallows, in conjunction with the Borough Engineer, Mr. F. W. Lacey, F.R.I.B.A., has already prepared a very fine design (which is now public property) for these buildings, and the intimation that so able a solution of a difficult problem is likely to be discarded will cause general surprise. It appears that the architects' joint appointment was made, under seal, in January, 1905, and that their scheme (and estimate of £100,000) was finally approved by the Corporation in June, 1906, after which the working drawings were duly proceeded with. About this time a local society, known as the Town's Interests' Association, approached the Local Government Board, protesting against the cost of any scheme of the nature of that sanctioned by the Corporation, and, in a letter to the Town Clerk (primarily sent in reference to certain difficulties connected with the Corporation's proposal to acquire some additional land to enable the building to be set further back from the street), the Local Government Board incidentally replied to the protest made by the Town's Interests' Association, "that *prima facie* the amount proposed to be expended upon the scheme appeared to be a large one, but that no definite opinion could be given until the usual public enquiry had been held." This very indefinite expression of opinion by the Local Government Board has been of great service to some zealous opponents of the scheme, who are apparently endeavouring to oust the present architects in order to have an open competition for a fresh scheme. The efforts of these persons, supported, we are sorry to hear, by one or two local members of the architectural profession, have been so far successful that, as we have said, the Committee has reported in favour of discarding the exceptionally good work of the appointed architects and of starting *de novo* with an open competition. However, it is only fair to the Corporation to state that the Committee's report has not yet been adopted, and we sincerely trust that, even at this the eleventh hour, justice may yet prevail. The facts we have thus briefly outlined may be reviewed from two different standpoints, namely, that of Messrs. Mallows and Lacey, and that of the profession at large. The architects might, very properly, say that the adoption of the Committee's recommendation would result in the committal of an act of signal injustice, as it would, inevitably, tend to cast a slur upon their professional reputation, because their scheme has not only received the approval and sanction of the Corporation of Bournemouth, but has met with the unqualified commendation of some of the leading architects of the day. As to the profession, although unfortunately it is well-known to be suffering from the effects of a lack of organisation and control, and consequently the collective virtue known as *esprit de corps* is rarely in evidence, yet we are sure the majority of its members will sincerely regret and deprecate the Committee's recommendation, which, if acted upon, is extremely unlikely to result in the erection of a good building. Further, we are certain that many practitioners will sympathise with two of their brother architects who are thus threatened with treatment of a kind that would not be tolerated in any other profession. Possibly, the R.I.B.A. may intervene and utter a more or less feeble protest, but, after all, this Institute represents only about one-third of the number of practising architects in the United Kingdom. Unfortunately, this, the leading architectural society, has little control over the actions of its members, and any refusal to allow them to compete for the work in question would not necessarily involve the failure of the competition, although the majority of the designs received would probably possess a very small amount of artistic merit. Public bodies, however, often appear to prefer badly designed buildings, so this aspect of the case may receive but scant consideration from the promoters of the proposed competition for new municipal buildings at Bournemouth.

The R.I.B.A. Prizes and Studentships.

The drawings submitted for this year's prizes and studentships of the Royal Institute of British Architects are now on view at the rooms of the Alpine Club. After a careful inspection of them, we do not hesitate to express the opinion that while draughtsmanship continues to advance by leaps and bounds, the far more important subject of design remains stationary. For example, a large number of the twenty-eight designs for the Soane Medallion (the subject being "A Custom House on a Quay") are distinctly bad, and, with perhaps two or three exceptions, those for "An Open-air Theatre," the subject of the "Tite Prize," are not of a high order of merit. As to the Grissell Gold Medal, eight of the nine designs received for "An Elevated Water Tank in Reinforced Concrete" are of so poor and commonplace a nature as to be beneath criticism. There are some good measured drawings among the exhibits, and plenty of charming sketches and clever delineations of existing buildings, but, on the whole, we think this exhibition plainly shows that our students have not

yet grasped the full significance of the fact that beautiful drawing is, after all, merely an *appanage* of the art of architecture. French influence is clearly discernible in the successful designs submitted by Mr. Drysdale for the Soane Medallion and the Tite prize, and it is instructive to compare his brilliant and attractive drawings with the more restrained and less artistic efforts of his fellow competitors.

Ilford Emergency Hospital Competition. A correspondent has drawn our attention to the unsatisfactory nature of the conditions issued by the promoters of this competition. It appears that designs are required for a hospital containing 100 beds, but that the building is to be so planned as to enable a small portion (containing 20 beds) of the complete scheme to be first erected at an outlay not exceeding £5,000. The unsatisfactory points in the conditions are as follows:—(1) Reference is made to an assessor, but neither his name nor his status in the profession (if he is an architect) is indicated; (2) there is no undertaking given that the work will be carried out, or that the author of the design selected by the assessor will be employed; (3) designs are required for the complete hospital, and the amounts of the premiums offered appear to have been determined on this basis, but should the selected architect carry out the first portion of the building, the premium received in respect of his design for the *whole building* is to merge in his commission on the £5,000 to be first expended. Should the hospital not be completed, the successful architect's remuneration for the work involved in designing the greater portion of the building would therefore be forfeited. We trust our readers will refrain from taking part in this competition, unless the objectionable features of the conditions to which we have drawn attention are amended.

What is "Engineering"? A suggestive definition of "engineering" was given by Professor Henry Adams in the course of his presidential address to the Institute of Sanitary Engineers last week. He said that when one saw every jobbing builder calling himself a sanitary engineer, and every plumber a hot-water engineer, one wondered what was included in the term "engineer." Engineering had been defined as "common-sense directed (by theory and practice) to works of construction." This, however, was a very wide definition, but the little parenthesis in the middle contained the essence; to be engineering the work must be directed by theory and practice. Although we heard so often of the "science" of engineering, it had been correctly pointed out that it was not an exact science; it was rather a combination of experience, judgment, and mathematics. The experience could be obtained only by actual work and observation; the judgment was the part that could not be learned, but must be inherent in the mental constitution of the individual; while the science of mathematics was, to an engineer, a good companion but a bad master, and always required to be tempered by experience.

No Restoration at Holyrood. Considering what a rumpus there has been about the proposed restoration of Holyrood Chapel, it is amusing, to say the least, that it should now be made known that the King has declined to sanction the proposed work. It will be recollected that the late Earl of Leven and Melville left £40,000 for this restoration, and immediately it became known what was proposed to be done, the "strife and turmoil" began. We were always of the opinion that no such restoration should be attempted: and that was the view taken by Professor Lethaby when asked to make a report on behalf of Lord Leven's trustees. But it now transpires that in any case His Majesty's sanction would first have had to be obtained, and one wonders why it was left so late as last week for Lord Stair to make the announcement that the King had declined to sanction the restoration. However, that sets the seal on the restorationists, for which let all true lovers of architecture be thankful.

Bricks from Slag. Some interesting figures in regard to the manufacture of bricks from blast furnace and other slag were given by Mr. Josiah Butler in a paper which he read at Dudley before the last meeting of the Staffordshire Iron and Steel Institute. At present it costs from 4d. to 6d. per ton of iron produced to convey the slag to the tip, and to this charge must be added the rental of the tipping ground: which means that, for a furnace giving an output of 800 to 1,000 tons per week, the cost of removing the slag to the tip alone would amount to about £1,000 a year. To utilise this waste product is therefore very desirable, and as it contains a large amount of lime and silica it can very well be adapted for making bricks. It has indeed been extensively used for that purpose on the Continent, where numerous plants are in active operation. Mr. Butler, at Messrs. Baldwin's works at Landore, near Swansea, has put down a plant modelled on those in Germany, with a daily output of 25,000 to 45,000 bricks. He states that the amount of slag required in the granulated form is about 3 tons per 1,000 bricks made. Tables of tests applied to these slag and refuse bricks made at Messrs. Baldwin's works show that some were only cracked under a load of 2,000 lbs. per sq. in., while others crushed at 3,100 lbs. Frost has no effect on such bricks after the re-action of the lime has taken place. The total cost of production, allowing for all charges (water, coal, lime, office charges, labour, material, etc.) works out at 12s. 6½d. per 1,000 bricks, on the basis of an output of 45,000 per 24 hours.

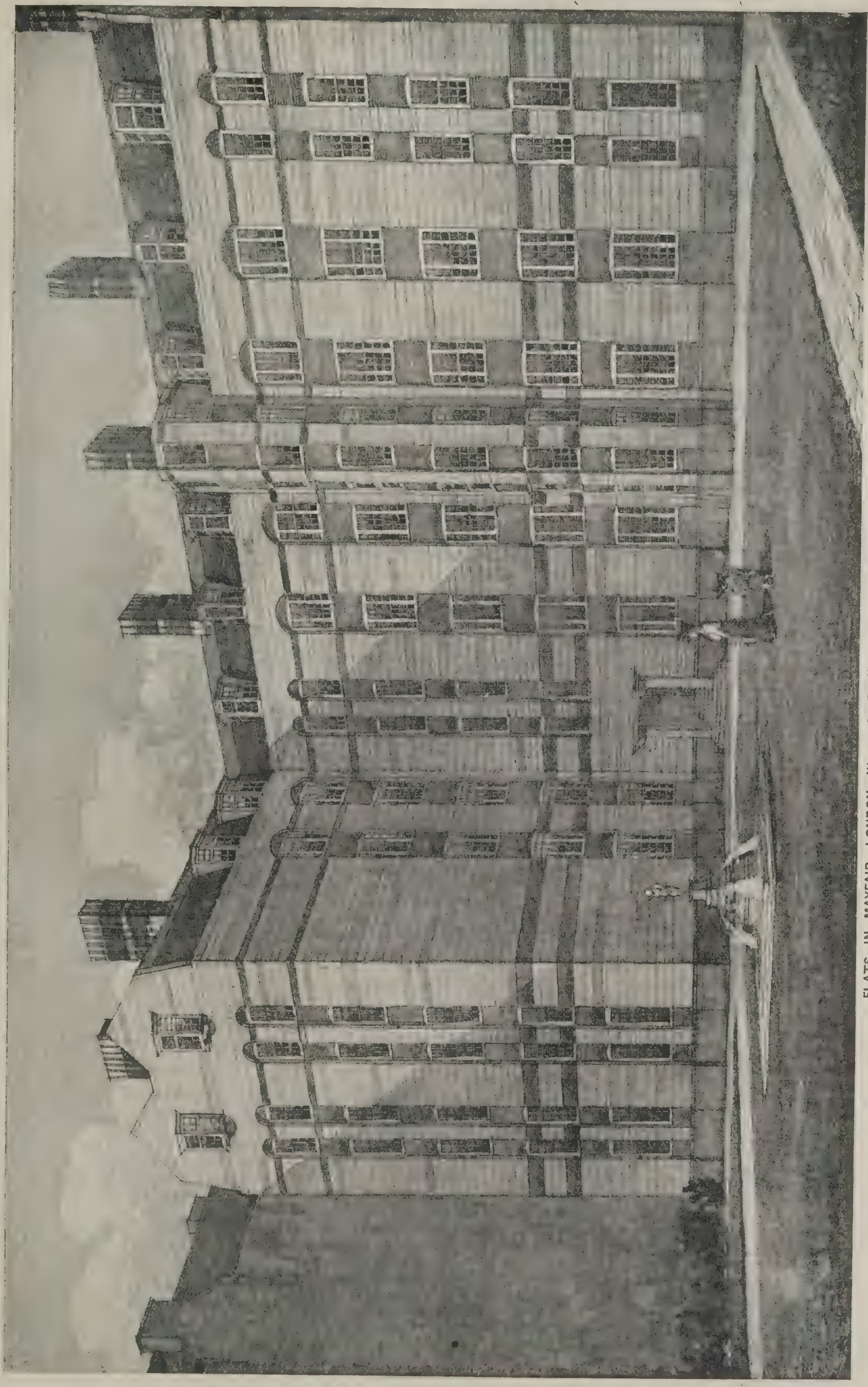
Telegraph Poles. The Postmaster-General, Mr. Sidney Buxton, speaking at Edinburgh recently at a luncheon given by the Corporation said, amongst other things, that the Post Office used for telephone and telegraph purposes about 60,000 poles a year, and that these poles were obtained abroad, as home-grown poles could not be obtained in sufficient quantities and at a competitive price. The postal authorities have made experiments on lands taken specially for the purpose with a view to the suitability of home-grown products, but without satisfactory results, either in quality or quantity. Yet there appears to be no reason why home-grown timber should not be able to compete favourably with a foreign product, especially as there would be no charges due to shipping. Silver fir is not so valuable as spruce fir, for the wood of the former has no resin canals running through it, whereas that of the spruce fir possesses this valuable natural addition. As larch poles are difficult to creosote, they are not much used for this purpose. Norwegian fir is principally employed for telegraph poles, and oak for the cross-pieces to which the insulators for the wires are fixed. The sample poles are tested as cantilevers to resist the stresses as near as possible to actual practice by placing the butt end into a metal cylinder 6ft. long, well packed and rammed with gravel. The cylinder is rigidly fixed in a horizontal position and the load is applied by means of weights (gradually added until the pole breaks) applied at a point where the resultant of all the tensions of the telegraph wires would act. Creosoted Scotch fir has a relative strength of about 89½ per cent of that of the foreign wood; with uncreosoted fir the relation is 81 per cent. only; cresosoting, therefore, increases the value of the Scotch fir. This variance in strength is perhaps due to the fact that Norwegian fir matures more slowly than the Scotch firs. A greater difficulty is that the latter cannot be at present obtained in sufficient quantities shapely enough to be useful, and of the requisite length (40ft. to 75ft.) for this purpose. Here is a field open for enterprising foresters!

Obituary.

MR. PHILIP C. LOCKWOOD, for 47 years borough surveyor (and later as consulting engineer and surveyor) to Brighton, died last week. He was in his 86th year.

MR. WILLIAM HARRIS, builder and contractor, of Bostal House, who died on November 29th, left estate which has been proved at £52,000.

Mr. J. B. Colson, F.R.I.B.A., architectural surveyor to the Dean and Chapter of Winchester Cathedral, died on January 21st, in his 55th year. He had been ill some time. He succeeded to the duties of architectural surveyor at the Cathedral on the death of his father in 1895, father and son having held the office successively for a period extending over more than half a century.



FLATS IN MAYFAIR, LONDON, W. S. B. K. CAULFIELD, F.R.I.B.A., ARCHITECT.

This illustration shows about one-third of a scheme not yet begun. The front elevations will face a garden, and the back elevations are to be on a courtyard, the average width of which will be about 60ft. "Carrara" ware and salt-glazed bricks will be used as the principal walling materials, with green Spanish tiles on the roofs.

MR. A. C. BENSON'S TRIBUTE TO WILLIAM MORRIS.

Mr. Arthur C. Benson, the well-known writer, has been contributing a series of miscellaneous articles to the "Cornhill" under the title "At Large." In the January issue he pays an eloquent tribute to the life and work of William Morris. Morris did so much to raise the condition of the arts and crafts allied to architecture, that we are sure our readers will read with close interest the following extracts from the article in question:—

" . . . . And thus, with a mind pleasantly attuned to beauty, and a quickening pulse, I drew near to Kelmscott. One comes to the goal of an artistic pilgrimage with a certain sacred terror; either the place is disappointing, or it is utterly unlike what one anticipates. I knew Kelmscott so well from Rossetti's letters, from Morris's own splendid and loving description,* from pictures, from the tales of other pilgrims, that I felt I could not be disappointed; and I was not. It was not only just like what I had pictured it to be, but it had a delicate and natural grace of its own as well. The house was larger and more beautiful, the garden smaller and not less beautiful, than I had imagined. . . .

"I cannot deny the name of hero to William Morris. Let us put into words what was happening to him at the very time at which he had made this sweet place his home. He had already done as much in those early years as many men do in a lifetime. He had written great poems, he had loved and wedded, he had made abundant friends, his wealth was growing fast; he loved every detail of his work, designing, weaving, dyeing; he had a band of devoted workers and craftsmen under him. He could defy the world; he cared nothing at all for society or honours. He had magnificent vitality, a physique which afforded him every kind of wholesome momentary enjoyment.

"In the middle of all this happy activity a cloud came over his mind, blotting out the sunshine. . . What began to weigh upon him was the thought of all the toiling thousands of humanity, whose lives of labour precluded them from the enjoyment of all, or nearly all, of the beautiful things that were to him the very essence of life; and, what was worse still, he perceived that the very faculty of higher enjoyment was lacking, the instinct for beauty having been atrophied and almost eradicated by sad inheritance. He saw that not only did the workers not feel the joyful love of art and natural beauty, but that they could not have enjoyed such pleasures, even if they were to be brought near to them; and then came the further and darker thought that modern art was, after all, a hollow and soulless thing. He saw round him beautiful old houses like his own, old churches which spoke of a high natural instinct for fineness of form and detail. These things seemed to stand for a widespread and lively joy in simple beauty which seemed to have vanished out of the world. In ancient times it was natural to the old builders if they had, say, a barn to build, to make it strong and seemly and graceful. . . . But now he saw that if people built naturally, they ran up flimsy walls of brick, tied them together with iron rods and put a curved roof of galvanised iron on the top. It was bad enough that it should be built so, but what was worse still was that no one saw or heeded the difference; they thought the new style was more convenient, and the question of beauty never entered their minds at all. They remorselessly pulled down, or patched meanly and sordidly, the old work. And thus he began to feel that modern art was an essentially artificial thing, a luxury existing for a few leisurely people, and no longer based on a deep universal instinct. . . The idea came to him, in a mournful year of reflection, that it was not only a mistake, but of the nature of sin, to isolate himself in a little Paradise of art of his own making, and to allow the great noisy, ugly, bewildered world to go on its way. . . . And so he plunged into Socialism. He gave up his poetry and much of his congenial work. He attended meetings and committees; he wrote leaflets and pamphlets; he lavished money; he took to giving lectures and addresses; he exposed himself to misunderstandings and insults. He spoke in rain at street corners to indifferent loungers; he pushed a little cart about the squares selling Socialist literature; he had collisions with the police; he was summoned before magistrates: the 'poetic upholsterer,' as he was called, became an object of bewildered contempt to friends and foes alike. The work was not congenial to him, but he did it well, developing infinite tolerance and good-humour, and even tactfulness, in his relations with other men. The exposure to the weather, the strain, the neglect of his own physical needs, brought on, undoubtedly, the illness of which he eventually died; and worst of all was the growing shadow of discouragement . . .

"And then at last, after every sordid circumstance of intrigue and squabble and jealousy, one after another of the organisations he joined broke down. Half gratefully and half mournfully he disengaged himself, not because he did not believe in his principles, but because he saw that the difficulties were insuperable. He came back to the old life; he flung himself with renewed ardour into art and craftsmanship. He began to write the beautiful and romantic prose tales, with their enchanting titles, which are, perhaps, his most characteristic work. . . . He had always held it to be a sacred duty for people to live, if possible, in whatever simplicity, among beautiful things; and it may be said that no one man in one generation has ever effected so much in this direction. He has, indeed, leavened and educated taste; he has destroyed a vile and hypocritical tradition of domestic art; by his writings he has opened a door for countless minds into a remote and fragrant region of unspoilt romance; and, more still than this, he remains an example of one who made a great and triumphant resignation of all that he held most dear, for the sake of doing what he thought to be right. He was not an ascetic, giving up what is half an incumbrance and half a terror; nor was he naturally a melancholy and detached person; but he gave up work which he loved passionately, and a life which he lived in a full-blooded, generous way, that he might try to share his blessings with others, out of a supreme pity for those less richly endowed than himself."

*A house that I love with a reasonable love, I think; for though my words may give you no idea of any special charm about it, yet I assure you that the charm is there; so much has the old house grown up out of the soil and the lives of those that lived on it; some thin thread of tradition, a half-anxious sense of the delight of meadow and acre and wood and river; a certain amount (not too much, let us hope) of commonsense, a liking for making materials serve one's turn, and perhaps at bottom some little grain of sentiment—this, I think, was what went to the making of the old house. . . . .

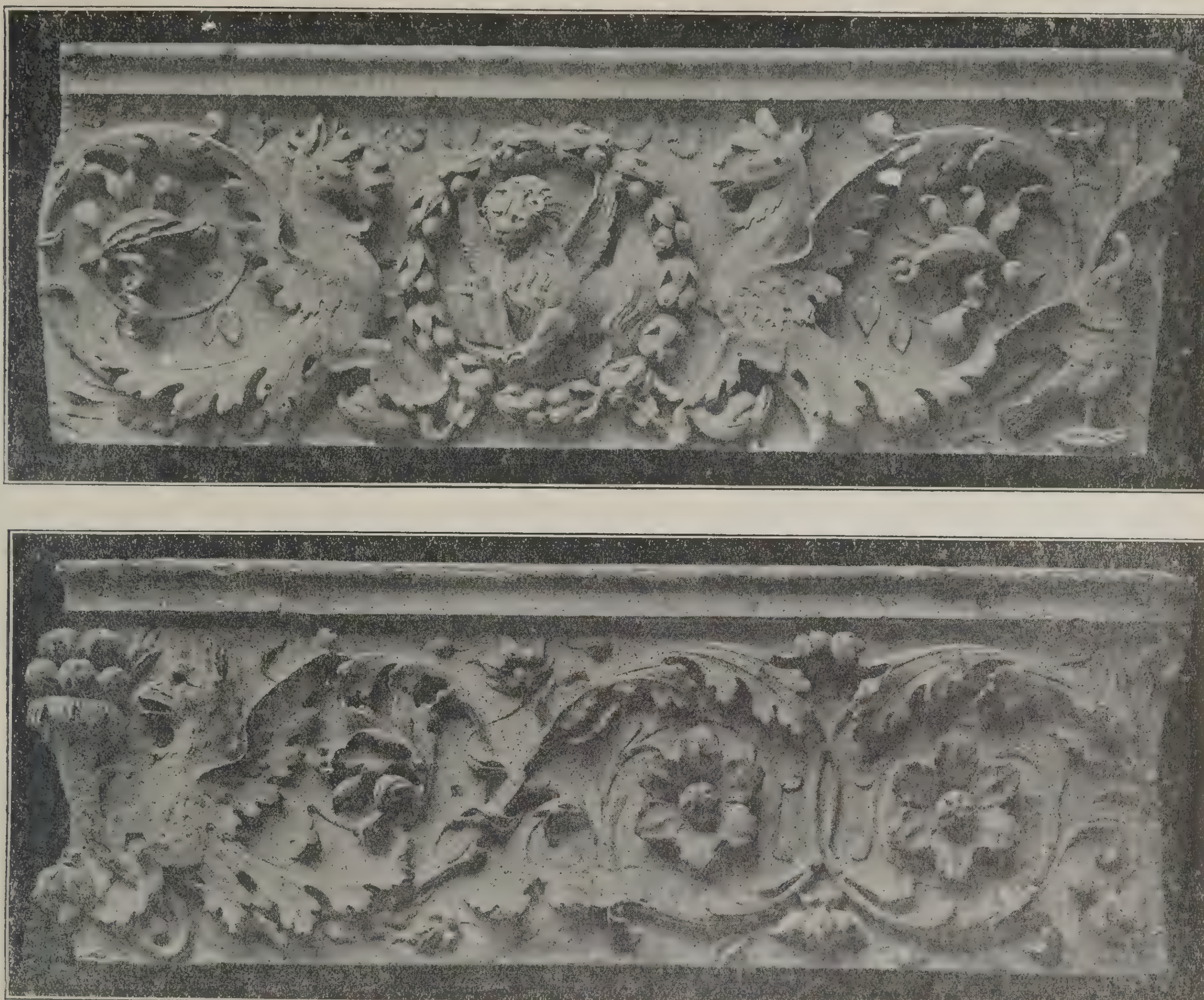
THE PROPOSED DIPLOMA IN ARCHITECTURE AT CAMBRIDGE.

In its issue for Monday last the "Times" published a letter from Mr. T. G. Jackson, Mr. Reginald Blomfield, and Mr. Basil Champneys in reference to the new School of Architecture proposed to be instituted at Cambridge University. After commenting on the question of a sound general education as the greatest desideratum, "supplemented by special instruction in the principles of construction, in history, and in art," the writers say:—

"We cordially welcome this statement of a very important principle; but the syndicate has no sooner laid it down in very handsome terms than it incontinently turns its back on it. On examining the proposed scheme, we find that this special examination for the ordinary B.A. degree is to be in two parts. Part I. is purely technical (practical mathematics, applied mechanics, strength of materials, descriptive geometry, surveying); and Part II. is to consist of the history of architecture of Europe and the Near Eest, outlines of the general history of art, architecture and the allied arts, subjects for an essay on a selected period, and the theory of art in relation to architectural design. The 'sound general education on liberal lines' has simply disappeared; and as to the merits of the scheme as a course of special training, we would submit that it has all the defects and none of the advantages of the older system of architectural training which architects have themselves found it necessary to reorganise. It has not the advantage of the system of simple apprenticeship, which at any rate brought the student into touch with actual work under the supervision of professional architects; it has its defects, in that it relies on the venerable and much misapplied definition of architecture as a science and an art, and emphasises the cleavage by a rigid separation into applied science on the one hand and history on the other. All these elements, applied science, history, and archæology, enter into architecture, but they are not architecture. The syndicate appears to have overlooked the fact that architecture is, after all, the art of design, under severely limited conditions; that it has its own peculiar technique just as the arts of painting and sculpture have theirs, and that though it is very necessary for an architect to possess scientific knowledge of materials and of the laws that govern their use, the knowledge so acquired does not make him an architect. The quality of the architect, that which differentiates him from the engineer or from the professor of mechanics, is the imaginative use to which he puts his knowledge as an artist in pure form. . . .

"Architects have themselves been revising their methods of training, and the whole gist of such reforms as have been accomplished lies in the directly practical bias of the training given. The instructors are architects in practice, and the training is supplemented by practical demonstrations in workshops and buildings in the process of erection. How is this to be done in the University? It can hardly provide the facilities for such training which exists in great cities, such as London, Liverpool, Manchester or Birmingham, where the elaborate apparatus required is at hand and important buildings are constantly in progress.

"It appears that the training proposed at Cambridge will be given by professors who will probably not be architects. With-



PORTIONS OF SCULPTURED ORNAMENT TO MARBLE CHIMNEY-PIECE IN THE DOGES PALACE, VENICE.

out the least desire to disparage their capacity we would point out that, by the nature of the case, the training given in architecture will almost inevitably be amateur training. Surely this country, as compared, let us say, with France, has suffered too long from the views of the amateur on architecture. We cannot help feeling that for purposes of training in the practice of architecture, the value of the proposed school at Cambridge will amount to nothing at all."

SCULPTURE AT SOUTH KENSINGTON.

On the buildings that form the last portion of the Victoria and Albert Museum at South Kensington, now rapidly approaching completion, are to be seen a large number of sculptured figures. It is interesting to record these.

The great central tower, rising to 215 ft., is crowned by a figure of "Fame" and at the base of the tower are figures of "Architecture" and "Sculpture" by Professor Lanteri.

Over the entrance are the figures of Queen Victoria, with St. George and St. Michael, and of the Prince Consort, with the statues of "Inspiration" and "Knowledge," the work of Mr. Alfred Drury, A.R.A.

King Edward and Queen Alexandra are represented in statues from the hands of Mr. Goscombe John, A.R.A., and the two large spandrels of "Beauty" and "Truth," over the arch, are by Mr. George Frampton, R.A.

The windows on the first floor of the building, on the fronts to Cromwell Road and Exhibition Road, are divided by niches containing statues of six English architects, six English sculptors, ten English painters, and ten English craftsmen, as follows:—

ARCHITECTS

William of Wykeham,	Sir Christopher Wren,
John Thorpe,	Sir William Chambers,
Inigo Jones,	Sir Charles Barry.

SCULPTORS

J. H. Foley,	Grinling Gibbons,
Alfred Stevens,	Sir Francis L. Chantrey,
John Flaxman,	John Bacon.

PAINTERS

Lord Leighton,	J. M. W. Turner,
J. Constable,	Thomas Gainsborough,
G. F. Watts,	George Romney,
Sir John Millais,	W. Hogarth,
Richard Cosway,	Sir Joshua Reynolds.

CRAFTSMEN

St. Dunstan,	Thomas Tompion,
William Torel,	Roger Payne,
William Caxton,	William Morris,
George Heriot,	Thomas Chippendale,
Huntington Shaw,	Josiah Wedgewood.

These statues are the work of Messrs. S. W. Babb, G. Bayes, A. Broadbent, W. S. Frith, J. Gamble, E. G. Gillick, A. H. Hodge, Lynn Jenkins, P. R. Montford, A. B. Pegram, J. W. Rollins, R. Shepherd, A. G. Walker, O. Wheatley, S. Boyes, R. Gouldon, V. Hill and J. A. Stevenson.

The architect of the new buildings is Sir Aston Webb, R.A. The contractors are Messrs. Holliday and Greenwood. Nine years have been employed in the erection of the structure.

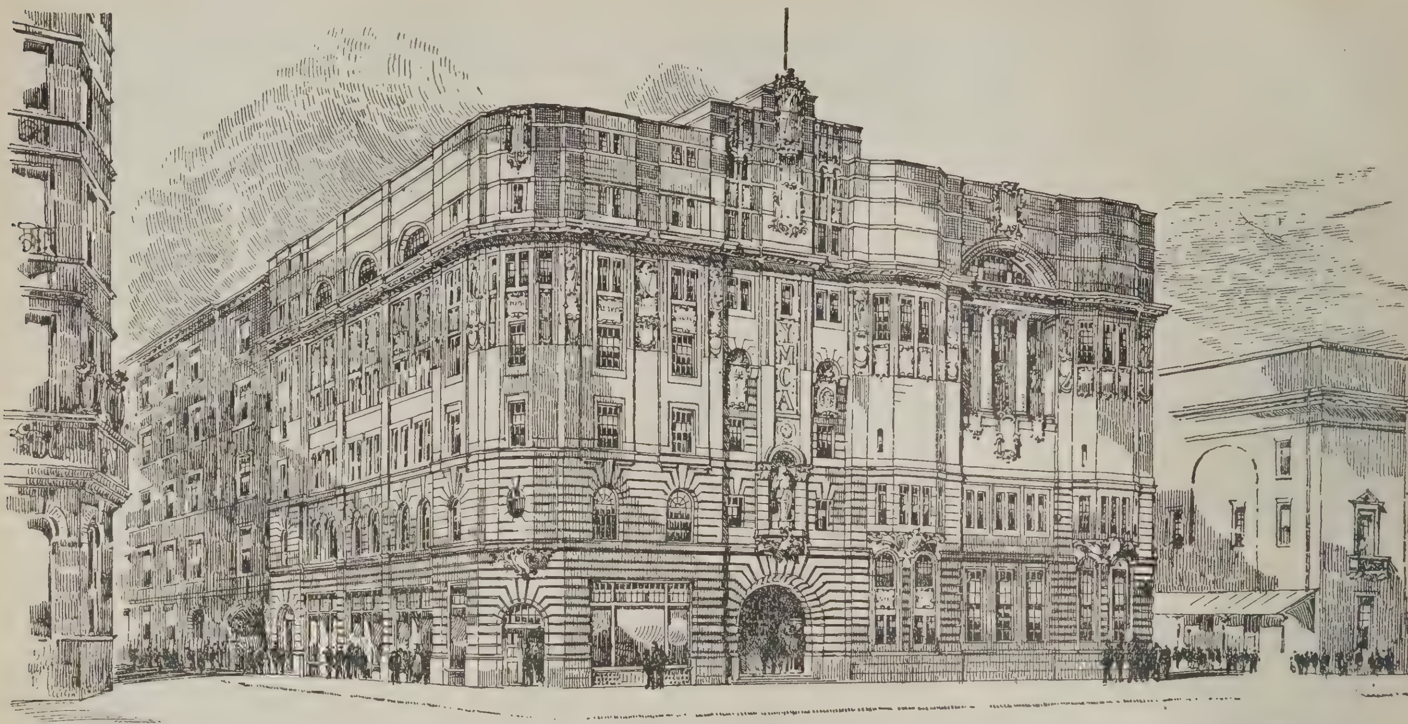
MARBLE ARCH IMPROVEMENT SCHEME.

His Majesty the King has approved Mr. Speight's scheme for the improvement of the Marble Arch.

The arch will remain as at present, but the railings extending from Park Lane are to be removed, and the space in the rear of the Arch will be cleared to a distance of 100ft.

The tablet marking the position of Tyburn Gate will not be interfered with, but the lodge and another small stone building standing in line with the Arch are to be removed and re-erected some distance in the rear.

As is generally known, the Marble Arch was not designed to stand amid its present surroundings, or even on its present site. It was erected originally, at a cost of £80,000, as the main entrance gateway to Buckingham Palace, and was intended to bear an equestrian statue of George IV., by Chantrey. In 1851, however, the Arch was removed, as being incongruous, and re-erected on its present site.



NEW Y.M.C.A. BUILDING, MANCHESTER: SELECTED DESIGN.

PENROSE'S PICTORIAL ANNUAL.

This 13th volume of "Penrose's Pictorial Annual" is a wonderful production in printing. The range of subjects is extremely wide, and the rendering of them quite remarkable for excellence. All the most modern methods are included, among these especially the colour blocks, made direct from nature. In a production so full of good work it is difficult to single out any one thing for superlative quality, but if we had to do so we think it would be the colour block of a group of old china, which is perfectly astounding for its accuracy in values. Numerous architectural subjects are represented, but, apart from these, the volume will have the greatest interest for all our readers.

"Penrose's Pictorial Annual, 1907-8." London: A. W. Penrose and Co., Ltd., 109, Farringdon Road, E.C. Price 5s. nett.

Notes on Competitions.

London County Hall.

At last week's meeting of the London County Council Mr. R. A. Robinson, chairman of the Establishment Committee, stated that the assessors were proceeding with the adjudication of the designs submitted for the new county hall, and their report was expected at the end of this week.

Perth City Hall.

A correspondent who has submitted a design for this new building has had the misfortune to lose his drawings. They were forwarded in proper form, but have gone astray somewhere. Should any reader hear of them, will he kindly communicate with us at once, so that the drawings may be restored to the author.

North of England Model Cottage Exhibition: Walker Estate, Newcastle-on-Tyne.

The Wallsend Co-operative Society, having taken sixteen sites on the above estate, invited architects to submit designs for cottages to be erected for exhibition in classes A, B, C, and D. Designs were received from architects practising in Sheffield, West Hartlepool, Sunderland, Newcastle, Willington-on-Tyne, and Wallsend. The committee have selected the designs of Mr. E. Cratney, of Wallsend, and Messrs. E. Davidson and Son, of Newcastle-on-Tyne. Ten of the sites have been awarded to Mr. Cratney, and the remaining six to Messrs. Davidson and Son.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.		COMPETITION.
Feb.	1	BRANCH BATHS AT ROCHDALE (to cost £7,500).—Premiums £25, £15 and £10. Assessor will be appointed. Conditions from S. S. Platt, Borough Surveyor, Rochdale. Deposit 10s. 6d.
Feb.	1	SECONDARY SCHOOL FOR BOYS AT MAIDENHEAD.—Premiums £100, £50 and £25. Assessor to be nominated by President of R.I.B.A. Conditions from the Secretary, Berkshire Education Committee, The Forbury, Reading. Deposit 5s. Summary in BUILDERS' JOURNAL, December 11th.
Feb.	1	CITY HALL AT PERTH.—To cost £25,000. Premiums £50, £30 and £20. J. J. Burnet, A.R.S.A., F.R.I.B.A., Assessor. Deposit, One Guinea.
Feb.	15	MUNICIPAL BUILDINGS AT SHANGHAI. — Conditions, together with site plan, may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.
Feb.	17	NEW COUNCIL OFFICES, &c., AT RADCLIFFE.—Limited to architects in Lancashire. Assessor, Mr. G. H. Willoughby, F.R.I.B.A. Premiums £75, £50, and £25. Conditions from S. Mills, clerk, Council Offices, Radcliffe, Manchester.
Mar.	7	SECONDARY SCHOOL AT LOWESTOFT—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft. Deposit, 5s.
April	28	ADMINISTRATION OFFICES AT PONTYPRIDD, for the Guardians.—Conditions from William Spickett, Clerk, Union Offices, Pontypridd, on or before January 31. Deposit £2 2s.
May	31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.

COMPETITION FOR Y.M.C.A. BUILDING, MANCHESTER.

In our issue for last week we published the assessor's award in this competition. We now illustrate the accepted scheme. The competitive designs were submitted early in 1907. Only four firms of architects in Manchester were invited by the Rebuilding Fund Committee to prepare designs for the new premises which it is intended shall replace the existing buildings in Peter Street: these firms were Messrs. J. W. Beaumont and Sons, Charles Heathcote and Sons, Woodhouse, Corbett and Dean, and Mr. John Ely. Mr. Thomas Worthington, F.R.I.B.A., was the assessor. On his recommendation, and with the approval of the Management of the Association, the Rebuilding Committee have unanimously selected the design of Messrs. Woodhouse, Corbett and Dean.

The several schemes submitted will be on view at the Association Rooms in Peter Street until the end of this week. Various modifications and alterations have been made in the accepted design and plans as originally sent in, though the view we publish (for which we are indebted to the "Manchester Courier"), is the one finally approved, but the plans illustrated have been taken from the competition set.

The selected design is the result of a careful study of the means adopted in similar buildings to properly meet the varied needs of the Association. The British branches and the preliminary plans of the extensive premises for the London Y.M.C.A. have also been carefully considered, as well as recent American examples, where this type of religious institution has been most fully developed. A glance at the perspective view shows how this scheme has been curtailed to meet the limitations of site, cost and height, particularly the last-named, as the height of the buildings was not to exceed 75ft. from the pavement level. The estimated cost of the proposed premises, including equipment, is £40,000. It is believed that the general arrangement and disposition of

the rooms will provide model accommodation for a Y.M.C.A.

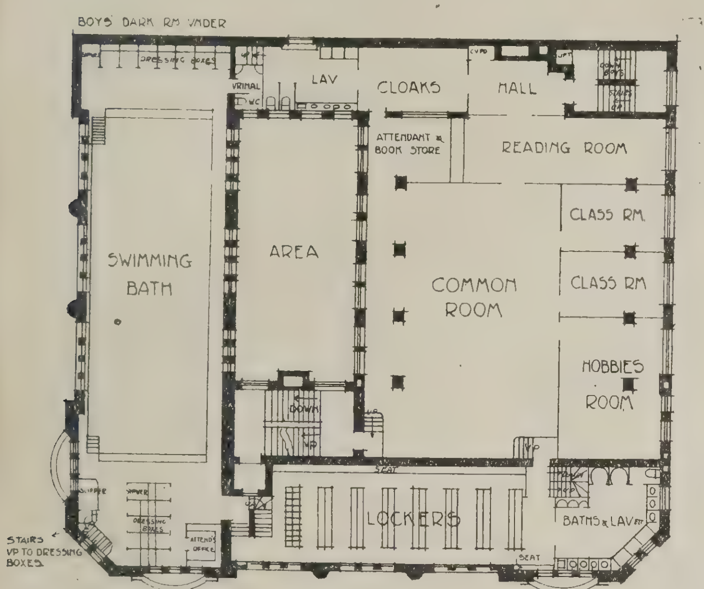
Considering the large number of rooms asked for, and the difficulties of light and air, owing to the squareness of the site, it must be admitted, after an examination of the eleven floor plans—including two basements—that the architects have made the most of the site, and are to be congratulated on attaining a simple but dignified exterior treatment.

The principal accommodation which controlled the lines of the plan was a large hall, capable of seating 1,100 persons with every convenience, and also a minor hall to hold 170 people. There are library and reading room, numerous class-rooms, a cafe, smoke room, billiard-room, a gymnasium, with a running track of 24 laps to the mile; a swimming-bath, 75ft. by 23ft.; fives courts on the roof; and ample accommodation for the junior section.

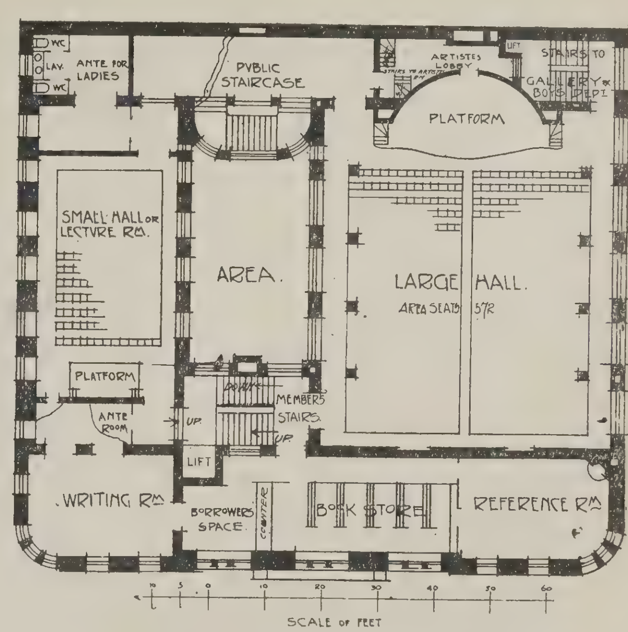
An unusual feature on the fourth floor for a public institution is the swimming-bath, with a very limited number of dressing boxes at either end of the pond. At first sight, this seems rather a bold idea to adopt, though we understand, in the New York Y.M.C.A.—the largest in the world—the bath there occupies a similar position. No great structural difficulties require to be overcome, but care will have to be exercised in selecting a suitable water-proofing material. The advantages gained by this position for a swimming-bath are considerable, as it was imperative that the bath and gymnasium should be within easy reach of one another, to allow the locker-rooms to serve as dressing rooms for both; therefore only by elevating the bath is it possible to place the gymnasium in the airiest and best-lighted part of the building—that is, at the top, a position of incalculable advantage to the health of the young men using it. It is equally advantageous to the swimmers to have a more airy and better lighted bath than could be secured in the basement.

Messrs. Woodhouse, Corbett and Dean, the successful firm of architects, also submitted an alternative set, which was simple in plan and decidedly unique in treatment, being Byzantine in style, with a modern rendering.

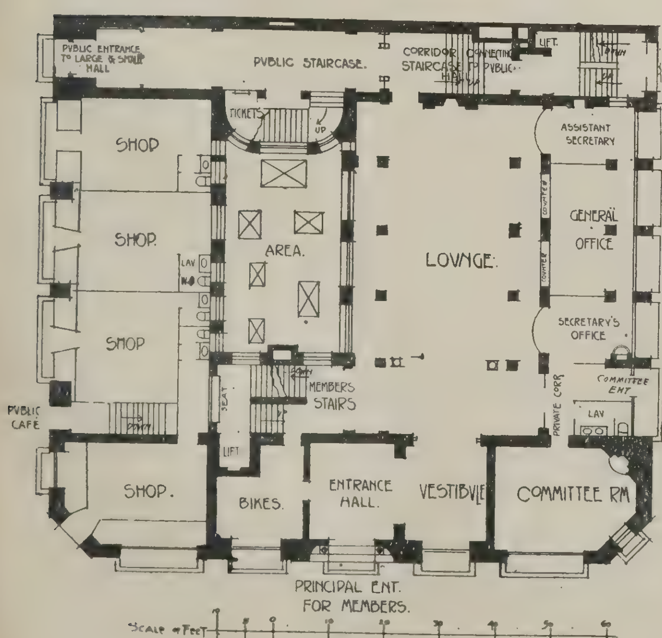
Reviving a Derbyshire Lead Mining Industry.—Messrs. George G. Blackwell, Sons and Co., Ltd., mineral merchants and metallurgists of Liverpool, have acquired the mining rights of the Northcliffe Sough and Red Rake lead mines at Calver, Derbyshire, and are now engaged in reviving the old industry of the district to its former activity. The Northcliffe Mine is being most vigorously worked. Since the commencement of Messrs. Blackwell's operations, about 400 tons of lead-ore stuff have been brought out, which will yield 60 tons of dressed ore, and about 300 tons of prime fluorspar.



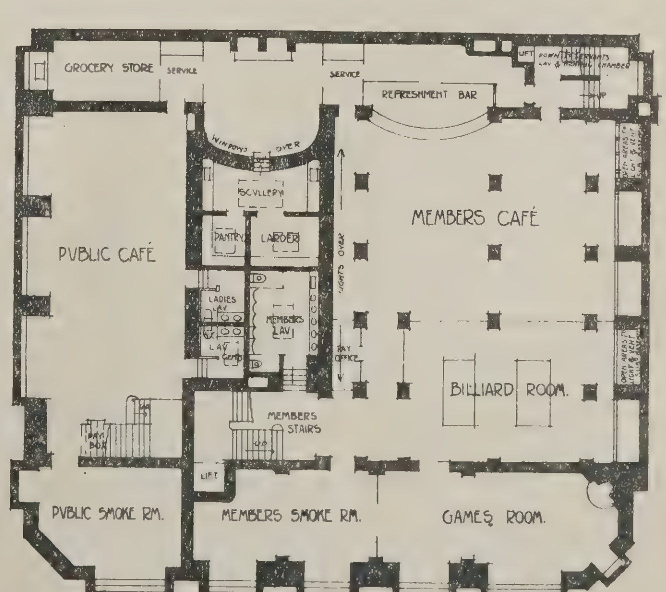
Fourth-floor Plan.



First-floor Plan.



Ground-floor Plan.



Basement Plan

NEW Y.M.C.A. BUILDING, MANCHESTER. WOODHOUSE, CORBETT AND DEAN, ARCHITECTS.

ELECTRICITY GENERATING STATIONS.*

Notes on their Planning and Design.

By Horace Boot, M.I.E.E., A.M.I.M.E.

I have selected my data from electricity works and power stations in the United Kingdom, America, Germany, France, Switzerland—in fact, most countries in Europe, where I have been.

Site.

In selecting a site, which is the first, and perhaps the most important point, it is necessary to consider local conditions, in which capital outlays is an important matter, but the main points to consider are:—

(1) The supply of fuel.
(2) The supply of water for condensing and boiler-feed purposes.
(3) The facilities offered by railway, river or canal.
(4) The question of nuisance and annoyance to surrounding neighbours.
(5) Available space for extensions.
(6) Subsoil and depth, together with the expense that will be necessary to obtain good solid foundations.

The question of nuisance to adjoining owners plays a very important part, as under the existing laws it is possible, although you may be working under Parliamentary powers, for adjacent owners to obtain an injunction and to shut down the works: the alternative being that one may have to buy up property at greatly enhanced prices.

Buildings.

The following requirements have to be met:—

(1) Main engine room.
(2) Boiler house.
(3) Pump house and auxiliary plant.
(4) Coal and fuel storage.
(5) Workshops for repairs.
(6) Stores and storekeeper's office.
(7) Battery room (if batteries are used).
(8) Testing room.
(9) Baths and wash-houses for engineers' department, general offices, men in charge and engine drivers, also for the stokers and men whose calling makes them require separate lavatories.
(10) Chimney shafts.
(11) Foundations for engines, boilers, pumps, main flues and general work of a builder's character.

For the above, the details and space required, height and depth of foundations, etc., should be given to the architect by the consulting engineer employed to carry out the work, and he should also inform the architect about how much the undertaking can afford to spend upon the buildings, as distinct from the other portions of the works.

It is interesting, therefore, at this stage, to tabulate a few power stations, showing the cost of the buildings as compared with the total capital outlay, from which it will be seen the cost of buildings varies considerably.

	Total Cost.	Cost of Land and Buildings	Kilowatts Housed	Cost of Buildings per Kilowatt
Brighton ..	£717,738	£149,431	5,400	£2·76
Glasgow ..	1,368,134	211,172	10,993	19·20
Bristol ..	671,616	53,550	9,050	5·91
Newcastle ..	1,192,442	169,675	20,000	8·48
Hackney ..	280,982	42,394	3,372	12·57
Metropolitan ..	1,802,383	435,777	18,500	23·55
Tonbridge ..	22,420	7,228	120	6.23
Tunbridge Wells	81,134	13,207	1,170	11·28

Whilst in no way sacrificing efficiency, the cost of the buildings should be kept low, because capital outlay has a great bearing upon the cost of production of electricity, and very often in the case of small works in their early days the capital outlay on buildings is likely to hinder the healthy and rapid development of the undertaking, owing to the necessity of charging a higher price per unit than would have been the case had the capital outlay been kept moderate.

* A paper read before the Society of Arts on January 16th.

In many power stations it is usual to provide a house for the engineer-in-charge, and one for the works foreman, also arranging if possible, and if space permits, to build workmen's cottages for the principal men employed.

If the buildings are situated in a town, and the walls are of brick, a neat appearance can be gained by the use of white-glazed bricks up to a height of 10 ft., finished off with chocolate glazed bricks and a cornice. The walls, or rather pilasters, must be of sufficient strength to carry rails on either side of the crane, which crane should be designed to lift not less than 10 tons, and in the case of big power stations, 20 tons.

With regard to chimneys, numerous designs are in use, but one design which deserves special mention is that of the Alphons Custodis Chimney Construction Co. It consists of hollow blocks, keyed with cement. I have had the experience of constructing two of these chimneys, with satisfactory results.

Flooring for Engine-Room.

The question of what forms the best flooring for an engine-room has often been debated, and so far as appearance goes it is hard to beat tesselated paving; but in this case it is necessary to section it up in squares, and I have found that if this is done and a gap of say ½ in. left, this space can be run in with a very hard setting compound, having sufficient give in it to prevent the pavement cracking.

Another form used is tile; but the trouble is, that heavy tools are often dropped, and invariably a tile is broken.

Wood block flooring has been used, but, with oil and grease about, it is very difficult and expensive to keep clean.

Where appearance does not matter so much, I am in favour of using blue bricks placed sideways, which forms a most efficient flooring so far as wear goes, but it does not look so neat as a tesselated one.

Refuse Destructors.

It is the practice of several authorities, and I venture to think the practice will increase rather than diminish, to combine the destruction of refuse for the generation of steam, and where such is the case the refuse destructor house should be so designed as to provide for an inclined roadway for the carts to deliver into the place from which the charging of the furnaces can be done direct. The destructor building is better apart from the engine house, otherwise trouble will be experienced by hot bearings caused by the dust. The refuse house should be well ventilated, and arrangements made for disinfection and cleansing.

Correspondence.

The Next Building Trades' Exhibition.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—I understand that another building exhibition on similar lines to that recently held by me at Olympia is being organised this year in London.

As several of your readers have already communicated with me on the assumption that I am responsible for this venture, I write to say that I have no connection with it in any shape or form, and that it appears to me to be merely an attempt to fill up the intervening year purposely left vacant by me at the request of all the leading representatives of the building trades.

My last exhibition at Olympia is practically just over, and I am already booking spaces for my next in the Spring of 1909.

The projected exhibition to which I refer has not even the merit of novelty, as it does not touch one single section of the trade not covered by my own exhibition.

I feel sure that the vast majority of your readers will agree with me that a good exhibition every alternate year is sufficient to meet the requirements of all sections of the building trade.

Yours truly,

H. GREVILLE MONTGOMERY.

London.

[Being of opinion that there is no need for a building trades' exhibition every year, we are quite in accord with Mr. Montgomery; this new scheme is entirely superfluous.—Ed. B.J.].

Greenwich Branch Library Fittings.

To the Editor of THE BUILDERS' JOURNAL.

SIR, — The arrangement and size of shelves shown in the above details of the magazine racks, published in your last issue, are somewhat unusual. Better examples of this form of rack can be seen in the libraries of Lewisham, Sheffield, Glasgow, etc. The shelves are generally arranged close together at varying pitches, in accordance with the height of the rack. A lip on the back of bookcase shelves to prevent books being pushed over is seldom used, certainly it is unnecessary when there is a back to the case, as shown in the details. Yours truly, F.

THE DRAINAGE OF LONDON.

In the course of his presidential address to the Institute of Sanitary Engineers last week Professor Henry Adams, M.I.C.E., M.I.M.E., etc., referred to the drainage of London. He said:—

The old Metropolitan Board of Works, which was in existence for thirty-three years, became in 1889 the London County Council, and although we often deplore the excursions of the latter body into ruinous commercial enterprises, we must not forget that the health of London has been well cared for, and distinctly improved, by the legitimate labours of the London County Council and its predecessor. To the Metropolitan Board of Works we owe the main drainage system of the metropolis and the Thames embankments. When the change of authority took place there were 82 miles of main and intercepting sewers, discharging a daily average of 160 million gallons of sewage, the works having been constructed between the years 1853 and 1865 at a cost of 4½ millions sterling. Now the main drainage comprises 346 miles of main and intercepting sewers, with a daily average discharge of about 253 million gallons. This flow of sewage represents a canal 33ft. wide, 7ft. deep, running night and day at 2ft. per second; and the yearly flow would fill a lake 7ft. deep and 75 square miles in area.

But sanitation does not mean sewerage only; the widening of thoroughfares, the pulling down of slum properties, the erection of artisans' dwellings, and the provision of public parks, have all been powerful factors in raising the standard of health during the last half-century.

The annual death-rate 120 years ago was about 1 in 30, 65 years ago it was 1 in 40, 40 years ago 1 in 50, 15 years ago 1 in 60, and now, for the last year, the death-rate for the 76 great towns of England was about 1 in 62, for the county of London alone 1 in 66, and for the Borough of Lewisham 1 in 83. These statistics represent an increase in the average duration of life of about 17 years—due chiefly to the combined efforts of the sanitary engineers and medical officers of health.

A CANDID CRITICISM OF OLD STAINED GLASS.

A meeting of the Architectural Association was held on Friday evening last at 18, Tufton Street, Westminster, the chair being occupied by the president, Mr. Walter Cave, F.R.I.B.A.

The following new members were elected:— Messrs. H. French (Preston, near Hull), J. L. Howe (Northwood), A. F. Morley (Northampton) and F. E. V. Tattersall (London). Mr. A. R. Jemmett was re-instated.

The president announced the list of R.I.B.A. honours gained by A.A. members.

A paper on "Stained Glass" was then read by Mr. J. Dudley Forsyth. At the outset of his paper Mr. Forsyth referred to the great assortment of material which was available at the present day, and to the progress that had been made in methods of glass painting, which was being brought to a pitch of excellence—far superior to much of the earlier glass painting (i.e., the bulk of church work in the Gothic style), in which all expressions were portrayed in the same way, with a crude heavy line.

"I fail to see," said Mr. Forsyth, "why the expression in faces is stereotyped, why figures in glass are hideous and have heads and other appendages very much too large or too small for their bodies, why the drapery with which they are clothed should suggest gas-pipes or corrugated iron. I am frequently being told where to see the finest old glass in this country, and I have invariably found on inspection that this glass, which is generally early Gothic, contains the most glaring mistakes and abounds in the unfortunate errors I have referred to. . . .

"The hall-mark of age does not necessarily stamp everything as excellent, and in this particular art there are many points which, if he were expert, the antique enthusiast would not catalogue his 13th century glass as being on an equal footing with other architectural enrichments of the same period. This can be accounted for in great measure. In those times they had neither the material nor the experience, and in consequence worked considerably in doubt, and were handicapped in their processes and methods. It is interesting to notice how very much more expert were the workers of that period in other crafts. Their carving of ornament, for example, was most beautiful. It was exquisite in design and finish, most cleverly managed and applied, and is one of the best examples of the use of ornament in architecture. Yet in glass, as in other crafts, they were conscientious, and utilised what they had to their best ability, and although, from my point of view, the artistic side suffered, the groundwork of their system was most correct. They knew what a window was for and knew how to treat it; and, if their drawing, colour and composition were at fault, they were faults on the safe side, for figures and groups of figures—not so much colour—were made to be less significant than construction in the design and the leading of it. . . . .

"What we must all appreciate in old glass is the way it was applied, for it was undoubtedly architectural. The correctness of old windows lay in their flatness. The conventionalities and crudenesses in design, owing to limited scope, accounted happily for a sound architectural treatment of what really is a structural surface, that has the same relative value in the building as a wall. We are reminded of the various phases through which it passed. It appeals to our sentiment to admire it. The quaint effects in forms and in the confusion of its patched-up design, as we view it to-day, the mellowed tones in colour caused by decay, corrosion, and vegetable growth on its surface, all tend to attract the attention, and to the canvas-painter these effects are glorious. But its chief value, if considered to be the finest art in this country, lies in its actual substance as being a relic of the past and a specimen of its period; and this we are most glad to have with us and to preserve."

The Architectural use of Glass.

Mr. Forsyth laid special emphasis on the necessity for treating stained-glass windows in an architectural manner, in which particular he very adversely criticised the large Gothic windows at Gouda in Holland, which had been held up to him as being amongst the finest glass in the world. These windows, in his opinion, were altogether wrongly constructed: they seemed designed purposely to ignore the architecture of which they really should be a subordinate part, and their treatment as one main straggling pictorial subject, with large unbalanced masses of colour, and figures of varying scale running through the mullions, was wholly wrong.

Mr. Forsyth's plea was for modern style, and opportunities for the employment of the modern materials and processes—such as shading with a flat matt, water stipple and oil tone, fine brushwork and needle-point to produce strong or delicate tones, half-tones and shadows—which, he contended, were technically sound.

To instance what could be done and had been done in technique, he drew attention to Swiss glass, chiefly of the 16th and 17th centuries, a magnificent collection of nearly 1,000 pieces of which is to be seen at the Laudes Museum in Zurich, mostly collected by Sir Henry Augst, His Majesty's Consul-General for Switzerland.

In the actual making of a window, Mr. Forsyth contended that unless the designer actually selected and marked out his shapes on the coloured sheets of glass, his work would most assuredly go wrong, and for this reason, that although the cutter might be well up in his work, and might have very thoroughly classified his material in numbers and letters, it was not possible that he could know the ideas and intentions of the designer concerning them.

On the other hand, it was equally difficult for the designer to mark the shapes on his outline with the letter or number with any feeling of certainty; in his selection, however, combined with the cutter's skill, would be found the successful issue.

Discussion.

In proposing the vote of thanks, Mr. C. Harrison Townsend said that the great secret in all crafts was the using of the materials at hand in an honest and legitimate manner, and he questioned whether the American method of super-imposing several sheets of different coloured glass in order to gain a certain effect was a legitimate method; he also referred to the use of the wheel in order to gain brilliance.

Mr. G. H. Fellowes Prynne said he thought the great difficulty in securing fine glass was in the many materials and mechanical devices now used in the production of it. He considered that in a building containing much stained-glass one scheme, historical or otherwise, should be carried throughout.

Mr. F. C. Eden was of opinion that the glory of stained-glass lay in its colour, not in the design or drawing. He also advocated the use of plain glass for country churches, thus affording a view of the landscape outside.

Messrs. F. E. Sidney, Arthur Keen, Louis Ambler, H. P. G. Maule, and the President also spoke.

Mr. Forsyth replied and the meeting terminated.

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

Removing Cement and Paint on Tile Floors.

COLNE.—T.E.S.P. writes: "Please give a good recipe for cleaning off encaustic tile floors where the cement has been left on in patches all over the floor by the builders, and paint dropped on same."

The usual method for cleaning off cement which has been dropped on encaustic tile floors is to apply diluted muriatic acid to the cement. As it is a powerful acid, it would be better to apply a 10 to 1 solution; if that is not effectual, then try it stronger, but do not let it remain longer than necessary, so as not to risk injury to the tiles. To remove paint on encaustic tiles use potash or soda made into a paste and allowed to remain until the paint is soft enough to remove.

T.P

Books for R.I.B.A. Examination.

LONDON.—C. writes: "What books would you advise for final R.I.B.A. (Special) Classic and Renaissance?"

Consult the list of books published in the current R.I.B.A. Kalendar. A few which may be specially mentioned are:—"Architecture of Greece and Rome," Anderson and Spiers; "Italian Renaissance Architecture," W. J. Anderson; "Early Renaissance Architecture in England," J. A. Gotch; "Renaissance Architecture in England," R. Blomfield.

G.

Belfast Wood Lattice Roof.

GLASGOW.—H. writes: "In which issue did you give an illustration of a Belfast wood lattice roof?"

See page 356 of our issue for July 16th, 1902.

A Book of House Designs.

WAKEFIELD.—F.S. writes: "Can you recommend a good illustrated book dealing with the erection of detached villa residences of an ornate character?"

"Homes for the Country," by R. A. Briggs; price 11s., post free from our offices.

Which Branch of Engineering is Best?

LLANGOLLEN.—E.V.E. writes: "A young man (21) who has taken a degree of Bac.Eng. at the Victoria University, and has now entered the Honours course, would like advice as to which branch of the engineering profession it would be best to take up. Would municipal, water, Government, railway or general civil engineering offer the best prospects? He is prepared to pay a good premium for

a thorough training with a firm of repute."

One might almost say that the prospects are equally bad in all branches, but possibly tramway, railway, or dock engineering offers the most scope for advancement if foreign service is not objected to. Opportunity is the chief thing, and if common-sense, health and energy are brought to bear upon it, success will ensue in any branch.

HENRY ADAMS.

Buildings to Measure in and Around London.

Referring to the enquiry by "A.E.B." on page 33 of our issue for January 8th, a correspondent sends the following list of Decorated, Perpendicular and Renaissance buildings within a radius of about twenty miles of St. Paul's Cathedral suitable to measure for the Royal Academy probationship and the R.I.B.A. Intermediate Examinations:—

Decorated.

London: St. Ethelreda, Ely Place, Holborn.
Westminster Abbey (chapter-house, cloisters, tombs of Aymer de Valence, Edmund Crouchback and Edward III.).

Essex: All Hallows Church Barking.

Kent: Royal Palace, Eltham (magnificent hall and roof). Permission to sketch from Office of Works.
Igtham Mote House, near Sevenoaks. The most notable mediæval mansion in the country.
Hever Castle, recently restored.
Penshurst Place, near Tonbridge (the seat of Lord-de-L'Isle).
Knowle House.
These houses all contain Decorated domestic work of about the date of Edward III.'s reign.
Orpington Church (doorway).
Church of St. Paulinus, Crayford, near Dartford (chancel and windows).
Church of St. George, Wrotham, near Sevenoaks. (This church consists of chancel, nave with aisles, south porch, western tower and rood screen, mostly of the Decorated period. The tower, being built close up to the western limit of the churchyard boundary, has a quaint vaulted passage through the lowest storey to enable processionists to go round the outside. This church would well repay measuring entirely.)

Surrey: Merton Church (porch and east end of north aisle).
Merstham Church.
Lingfield Church (tower and west end).

Perpendicular.

London: Westminster Abbey (Henry the Fifth's Chantry, Henry the Seventh's Chapel, Bishop Islip's Chantry).
St. Dunstan's Church, Stepney.
St. Giles', Cripplegate.
St. Saviour's Cathedral, Southwark (high altar, screen and transepts).
Crosby Hall, Bishopsgate Street.

Essex: All Hallows Church, Barking (Bay of choir arcade).
Morgovetting Church.
Mountnessey Church.
Ingatestone Church (fine brick tower).
Hutton Church.
These churches are all close to one another and within easy train distance of Liverpool Street.
Chingford Church (brick porch).

Kent: Chiddingstone Church, near Tonbridge (porch, date A.D. 1626, and fine tower — both works of great value).
Church of St. Paulinus, Crayford, near Dartford (chantry chapels).

Surrey: Merton Church (chancel).
Merstham Church.
Banstead Church.
Thames Ditton Church.
Lingfield Church (all except tower and west end).
Crowhurst Place.

Renaissance.

London: St. Paul's Cathedral.
Boones Chapel, Lee, S.E.
The Orangery, Kensington Palace.
Somerset House.
The Horse Guards, Whitehall.
Water Gate, York Stairs, Thames Embankment.
Houses in Cavendish Square, formerly lodges to proposed mansion of Duke of Chandos.
The Domitory, Westminster
Parish Church, Hampstead.
St. George's Church, Hanover Square.
St. John's Church, Westminster.
Church of St. Mary-le-Strand.
St. James's Church, Piccadilly.
Parish Church, Chelsea.
No. 60, Lincoln's Inn Fields.
King Henry's Gate, St. Bartholomew's Hospital, Smithfield.
Library, Lambeth Palace.
The Brewers' Hall, Addle Street, Aldermanbury.
The Ironmongers' Hall, Fenchurch Street.
The Merchant Taylors' Hall, Threadneedle Street.
The Grocers' Hall, Princess Street, E.C.
The Charterhouse.
Trinity Almshouses, Mile End Road, E.
St. Margaret's Church, Lothbury.
All Hallows Church, Lombard Street.
Church of St. Mary Woolnoth.
St. Stephen's Church, Walbrook.
Church of St. Mary-le-Bow, Cheapside.
Christ Church, Spitalfields (a magnificent church, well worth study and measurement).
St. Bride's Church Fleet Street.
St. Magnus Church, London Bridge.
St. Martin's Church, Ludgate Hill.
St. Mary's, Abchurch Lane.
St. Nicholas Cole Abbey, Queen Victoria Street.
Holy Trinity, Gough Square (a chapel of ease to St. Bride's Church, Fleet Street).

Essex: Chigwell—King's Head Inn (the "Maypole Inn" of Dickens in Barnaby Rudge); Chester room, cedar panelling and fine old chestnut wood chimney-piece.

Herts: Hatfield House—marble hall and staircase, long gallery, King James Room, dining and drawing rooms, armoury and chapel.

Kent: Morden College, Blackheath.
Bromley College.
Cobham Hall, near Rochester, the seat of Earl Darnley.
King Charles wing, Greenwich Hospital.
St. Alphege's Church, Greenwich.

Middlesex: Hampton Court Palace.
Enfield Palace, now used as post-office (permission to sketch from Office of Works).

Surrey: New Place, Lingfield and Brockfield, two fine old houses.

It must be pointed out that it is difficult to obtain permission to measure in Westminster Abbey and St. Paul's Cathedral, but there should be no difficulty about any of the others, with the exception perhaps of St. Ethelreda's Chapel, Ely Place, Holborn.

Windows in Mansard Roof.

X.Y.Z. writes: "Is a window in a Mansard roof formed by carrying up the framing from the pole plate, or is it usual to set it back some distance?"

There is no rule as to the position of windows in a Mansard roof, but they are usually near the end of the tie-beam, with dormer roof and cheeks, and a more or less ornamental front, with or without pediment, according to circumstances.

HENRY ADAMS.

Sanitary Appliances and Plumbing.

CHATHAM.—G. writes: "Do you know any recent publication on sanitary appliances or plumbing that you can recommend?"

"The Modern Plumber and Sanitary Engineer," edited by G. Lister Sutcliffe, A.R.I.B.A., M.R.S.I., etc., in six volumes; price 6s. each, post free from these offices.

Museum Planning.

MANCHESTER.—W.T.R. writes: "Can you inform me of any publication on the planning of museums?"

A book entitled "The Arrangement of Museums, Libraries, and Picture Galleries," by J. W. and W. Papworth, was published in 1853, and though its information is now rather out of date, it may be of some service to you. "The Principles of Planning" by P. L. Marks, also gives a brief outline of the elementary points to be observed in museum planning. A paper on "Gallery Building" was read before the R.I.B.A. by A. W. Weissman on April 22nd, 1907, and is reported at length in the Institute Journal. This gives much information, and many illustrations and plans of modern museums and picture galleries. Copies of the journal may be obtained at No. 9, Conduit Street, W., price 1s. each.

G.

The Temple Gateway.

X. writes: "Are there any published drawings of the old gate to the Temple opposite Chancery Lane?"

Measured drawings of Wren's gateway to Middle Temple Lane were published in the "Architectual Association Sketch Book," 3rd series, Vol. VII. The gateway to the Inner Temple, with the timber fronted building over (No. 17, Fleet Street) does not appear to have been recently illustrated by any published architectural drawing, though photographs and sketches appeared in the illustrated press at the time of its restoration by the L.C.C. a few years ago.

G.

Public Houses.

LONDON.—C. writes: "Is there a book published on public house construction and fitting?"

There is no such book published.

CONCRETE AND STEEL SECTION.

(MONTHLY).

A CONCRETE INSTITUTE.

Concrete and reinforced concrete has made such rapid strides during the past three years that it is not surprising to now hear that matters appertaining to the subject are to be dealt with by a special institute to be known as "The Concrete Institute."

We understand that such an institute is in the course of formation, and we need hardly say that this new society will have our good wishes. Apart entirely from its usefulness in the advancement of concrete and reinforced concrete by the presentation of papers and their discussion, by research work and enquiry, and above all by the opportunity afforded by such an institute for men, who are at present strangers, to meet and discuss both formally and informally technical matters on which they may have differences of view, there cannot be the slightest doubt that any fresh opportunity afforded for architects and engineers to meet, and again for architects and engineers to meet the leaders of the building industries concerned, must be beneficial to all concerned.

The subject is one that essentially requires the co-operation of the architect, engineer, chemist, mathematician, the specialist, and the contractor, and it is well known that similar co-operation has been most useful in municipal engineering, constructional engineering, and in shipbuilding, all matters in which Great Britain excels.

We trust by the time our next "Steel and Concrete Section" is issued, full particulars of the institute will be available, and that the institute may have been formally incorporated. In the meantime it is probably not divulging any great secret to say that the start is being made under most influential auspices, and that there is every prospect of the institute becoming one of which this country may be as proud as it is of its "Iron and Steel Institute."

DOVER BARRACK ACCOMMODATION.—It has been decided to increase the barrack accommodation at the Western Heights, Dover, and the Secretary of State for War has instructed Mr. W. H. Grigg to carry out extensions of A, B, F and K blocks of the married quarters at South Front Barracks. The work has already been commenced and will probably be finished about the end of March.

WIMBLEDON'S NEW THEATRE.—Mr. J. B. Mulholland, of the King's Theatre, Hammersmith, is erecting a large new theatre at Wimbledon; it is expected to be opened next autumn. The auditorium will be fan-shaped and the circle will be brought forward so that its edge overhangs the tenth or twelfth row of stalls. The King's Theatre, Hammersmith, holds 2,750 persons; the Wimbledon Theatre will hold 3,650.

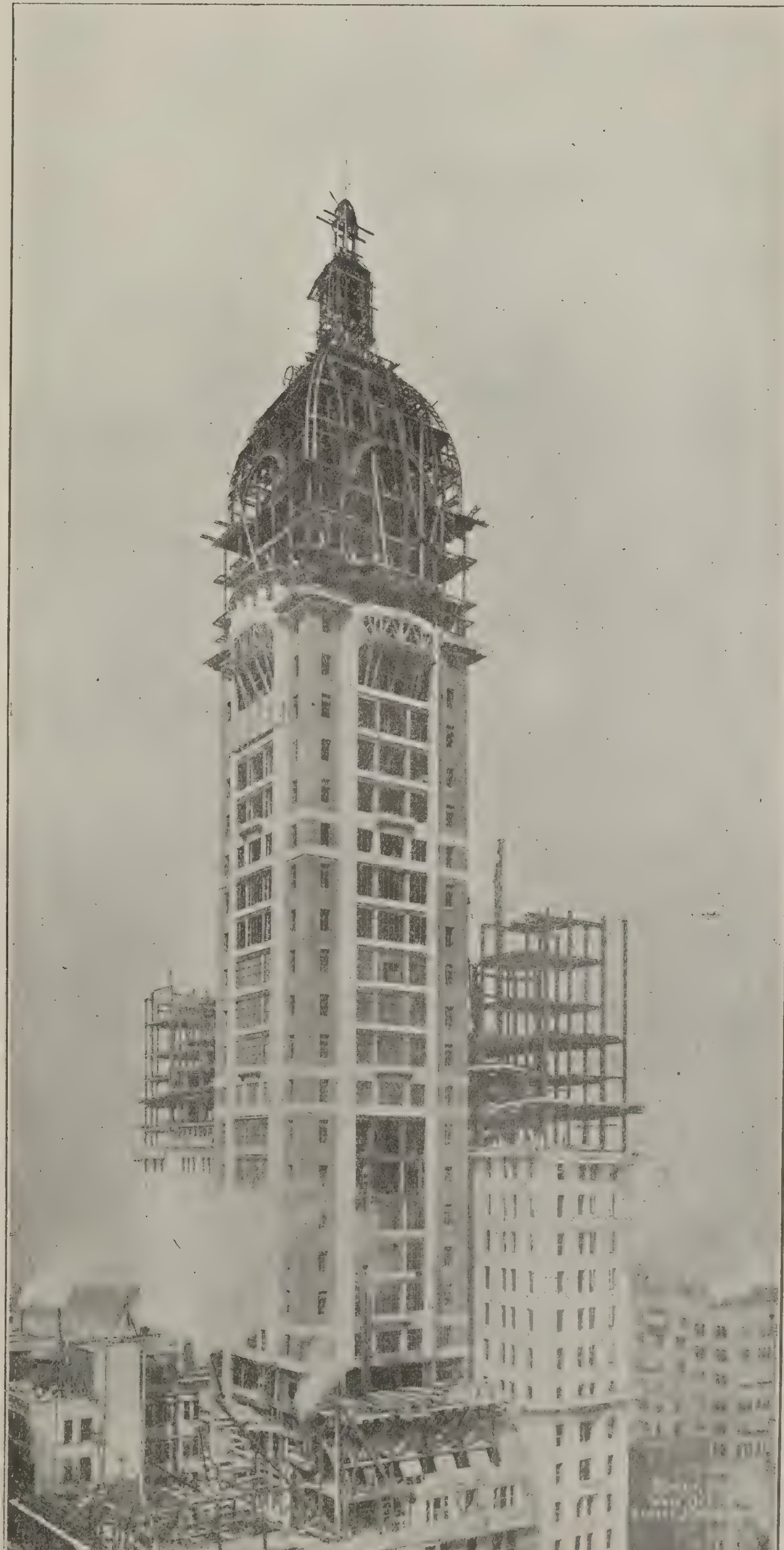


FIG. 1.—THE SINGER BUILDING, NEW YORK, IN COURSE OF CONSTRUCTION.

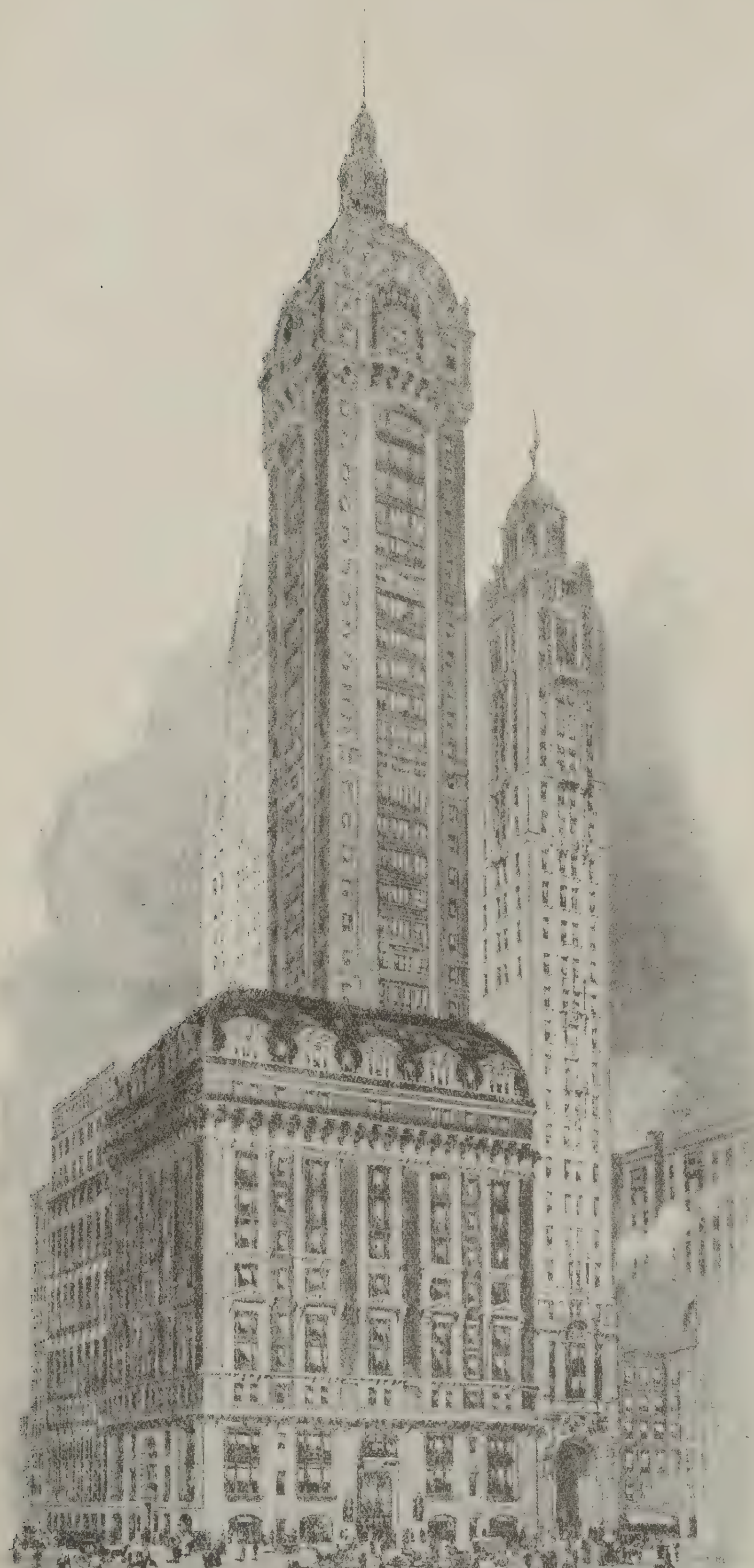


FIG. 2. THE SINGER BUILDING, NEW YORK, ERNEST FLAGG, ARCHITECT.

THE SINGER BUILDING.

The new Singer building which is being erected in New York City, and will be completed next April, will be the tallest building in the world. Its appearance last October is shown by Fig. 1, and its general appearance when completed will be as shown in the perspective view, Fig. 2. The illustration, Fig. 5, affords an interesting comparison of the new Singer building with the world's best-known buildings. The Singer Building will rise to 612 ft. above the street level, and will have 41 storeys and 1,000 rooms. Even higher than this, however, will be the projected Metropolitan Life Building, which is to have 46 storeys, reaching to a height of 658 ft. Formerly the tallest building was the Philadelphia City Hall, which is 547 ft. high. Compared with these giants of America, Cologne Cathedral is 515 ft. high, the Great Pyramid 486 ft., and St. Pauls Cathedral 404 ft.

The new Singer Building is a combination of two old steel frame buildings on the corner of Broadway and Liberty Street with an adjoining new structure fronting on Broadway and extending back to the same depth as the two old lots. The old buildings, originally 11 stories, have been raised to 14 stories and the new structure consists principally of a 41-storey tower with a four tier lantern which rises to a total height of 612ft. above the sidewalk. The architectural treatment of the new portion has been made to harmonize with the old, a particularly ornate design with a red facing wall trimmed with white stone window casings and cornices. The slender square tower, with its gracefully tapering cupola and tall lantern look-out, rising far above the mass of high buildings of lower Manhattan, adds a striking landmark to that already picturesque skyline.

There is a total floor space in the building of 9½ acres, there being 20,000 sq. ft. available on each of the 14 floors of the main portion and 3,300 sq. ft. on each of the tower floors, in no one of which are there any inside rooms. There are four elevators rising to the fourteenth floor and four more to the 35th floor, which is the last floor in the square section of the tower. Above this the curved cupola rises to the 40th floor, at which point the lantern starts. There are really 48 so-called tiers or levels of horizontal beams, this including certain mezzanine floors and the small area landings in the lantern.

The entire building is of skeleton steel construction, fireproofed with terra-cotta tiling and provided with terra-cotta floor systems surfaced with cement. The columns are founded on concrete footings sunk by compressed air caissons some 90 feet below street level to bed rock. Except in three cases, these concrete footings are arranged so as to each carry a pair of columns, the load being distributed from the column through cast steel bases to a single I-beam grillage, made up in some cases of I-beams as large as 24ins.

The customary practice is followed by placing the concrete footing and I-beam grillage so that the differing loads on the two columns will centre over the centre of gravity of the footing. In two of the three cases, where a single column bears on a footing, small circular caissons were driven, and in none of these three was an I-beam grillage used, the steel castings resting directly on the concrete.

Fig. 6 illustrates the heaviest of the cast steel shoes used for column bases. This base will have a computed load of 747 tons, without wind, and 868 tons with wind acting. The bases are made out of mild steel, with a very high specified elongation test. A great deal of trouble was experienced in testing the material, as the metal provided by the shop would not show up well enough in the elongation tests. Finally, the inspection requirements were satisfied, and the shoes as placed, have not showed any weak places as yet.

The structural details of the main 14 storeys have nothing out of the ordinary. The columns are spaced uniformly at 12ft. c. to c., connected at right angles by I-beam wall and floor beams. The corners and elevator shafts are wind braced with diagonals, but there is no horizontal floor or wind bracing. The columns are made up of a double channel section, enlarged where needed, by the addition of flat plates. The largest column is shown on Fig 7, and consists of two 15in. channels, four 20in. by $\frac{7}{8}$in., two 20in. by $\frac{3}{4}$in., eight 14in. by 13-16ths in., and two 12in. by $\frac{1}{2}$in. plates, a total section of 235 sq. ins. for a total load of 3,400,000 lbs. These columns have a standard length of 13ft. 4ins. between floors. The outside columns stop at the 36th floor, above which outside walls are carried on curved double-channels (Fig. 9); the inside columns still continuing. Above the 40th floor the lantern construction is carried up with light angle columns to a smaller cupola formed with curved angle columns.. A steel flag-pole, not shown on the drawing, passes through the hole in the very top of the cupola, and is anchored in the socket shown at the 43rd floor.

The wind bracing on the tower is of extraordinary interest. On account of the small section of this tower and the necessity for as much window space as possible it was deemed inadvisable to cross-brace the entire structure or even its entire faces. As will be noted from Fig. 4 the plan of the tower is divided symmetrically into 25 squares each 12ft. on a side, by columns running from foundation to the beginning of the cupola. The tower is wind braced and stiffened by treating each one of the corner squares as a separate tower and bracing it on all four of its sides by crossed diagonal struts. In addition the three closed sides of the elevator shafts are treated in a similar manner.

In designing the wind bracing on the assumption that each of the small 12ft. by 12ft. towers to be independently capable of taking wind stresses, a theoretical uplift is exerted on each of the bases of the columns at the corners of the braced towers. To provide for this uplift, these columns were anchored into the concrete caissons on which they rest. All of the outside columns carry an extra dead load due to the weight of the brick walls largely exceeding the uplift from the wind and therefore no anchors were provided for them. On the internal columns, these anchors were placed.

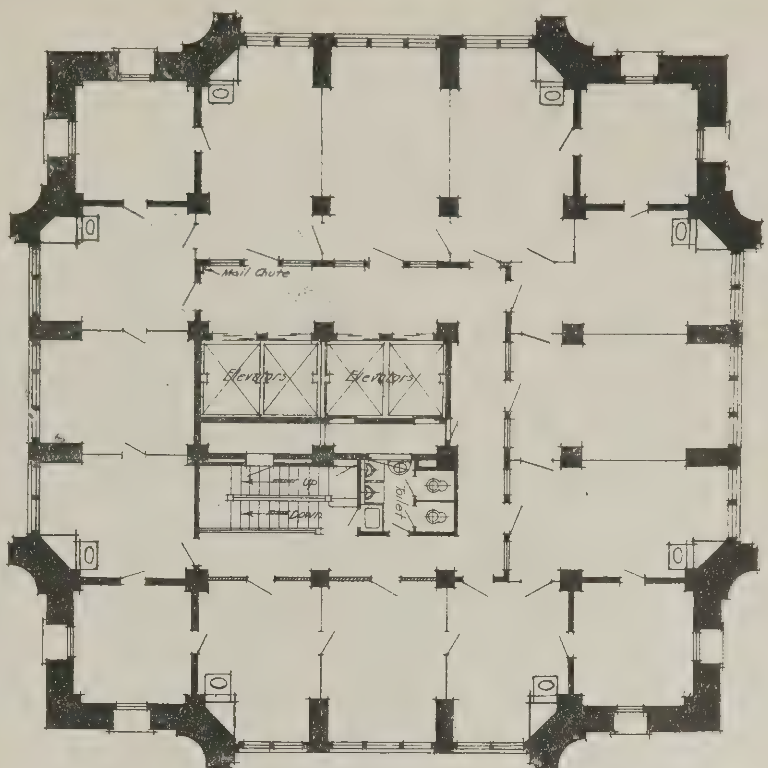


FIG. 4. TYPICAL TOWER FLOOR PLAN IN THE SINGER BUILDING.

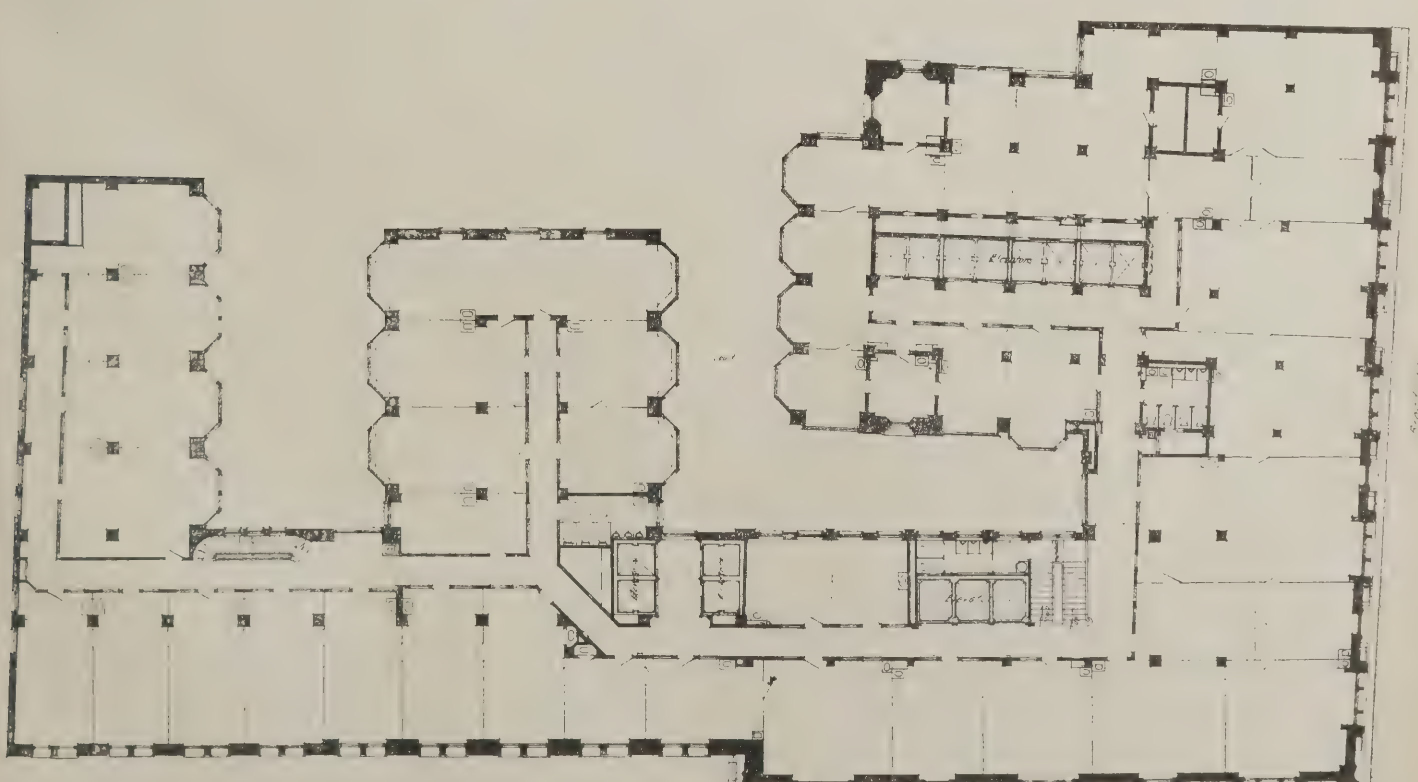


FIG. 3. TYPICAL FLOOR-PLAN IN THE SINGER BUILDING.

FIG. 5. THE SINGER BUILDING COMPARED WITH THE GREAT BUILDINGS OF THE WORLD.

St. Peter's, Rome, 400 ft. Philadelphia City Hall, 557 ft. Pyramid, Egypt, 485 ft. Salisbury Cathedral, 400 ft.
Cathedral, Rouen, France, 490 ft. Park Row Building, N.Y., 382 ft. Washington Monument, 555 ft. St. Isaac, St. Petersburg, 365 ft.
Madison Sq. Garden, N.Y.C., 305 ft. Singer Building, New York City, U.S.A., 612 ft. Sta. Stephen's, Vienna, 450 ft.
Cathedral, Cologne, 516 ft.
Sta. Sophia, Constantinople, 200 ft. Post Office, Sydney, 262 ft.
The Giralda, Seville, 350 ft. City Investing Co. Building, N.Y.C., 400 ft.
The Pantheon, Rome, 150 ft. Campanile, Venice, 325 ft,

The details of these anchorages are shown in Fig. 8. A small angle iron grillage was embedded in each one of the caissons as it was built, and in such a position that when the caisson reached its bearing the grillage would be at approximately an elevation 60ft. below datum. To this grillage there were fastened flat plates increasing in number and in size as they neared the top of the concrete and connected with pins. Originally it was intended that these connecting bars should be round rods, but owing to delays in manufacture these flats were substituted.

As the caissons do not always sink in a straight plumb line, cast rocker-saddles were provided to be put in about 20ft. below datum by means of which the anchors above could be adjusted into a plumb line. Details of this rocker are shown on Fig. 8.

From these rockers the anchor is made of two round rods $3\frac{1}{2}$ins. in diameter in columns, 15ins., 16ins., 21ins., and 22ins., and $4\frac{1}{2}$ins. in diameter in the other anchorages. These rods pass by the grillage between the I-beams and outside the cast-steel bases up to a saddle riveted to the column.

This saddle consists of a block spanning the heavily plated ribs which are riveted up the column for a distance of from three to five feet, varying on the different anchorages. These saddle blocks are notched on both sides so as to engage with similar lugs on the ribs and thus make a firm, immovable bearing.

In those columns, where the blocks spans have but two vertical ribs, a lower lug or projection is provided to give additional strength. The anchor rods pass through these blocks and are fastened thereto with nuts and washers which are easily accessible and can be inspected and tightened at any time.

The detail of the base of the column with its additional heavy plates is shown in Fig. 7. Up to the present, when the entire steel work is finished and the brick face walls up to the top, this system of wind bracing has proved remarkably efficient; the tower is one of the stiffest steel structures in New York City.

The following are a few interesting particulars regarding other portions of the structure. The tower shows on each side an immense bay window, extending from the 14th to the 34th storey each capped with an arch supporting a semi-circular balcony. There are 16 electric elevators in the building, each having a speed of 600ft. per minute. In the basement there are safe deposit vaults and five Babcock and Wilcox boilers, aggregating 1,925 horse-power for heating and power purposes. There are 7 steam engines, 5 large dynamos, 32 pumps, 2 air-compressors, an ice plant, and a vast number of accessories for the convenience of tenants. The lighting system includes 15,000 incandescent lamps internally, while the facades of the tower will be illuminated and the lantern crowned by a search light, the rays of which may be seen for a distance of 60 to 75 miles. The water piping of the building is sub-divided into that for ordinary house service, ice water service, and that used in event of fire, each system independent of the other. In every office there will be a suction air brush connected with the vacuum cleaning system. The entrance hall will be lavishly decorated with marble and bronze doors, grilles, stair rails, etc. The weight of the tower is 18,365 tons. The weight of the steel in the entire building is 9,200 tons. The materials of the facades are pressed brick and Indiana limestone.

The Singer Building is being erected by the Singer Manufacturing Co. The architect is Mr. Ernest Flagg, to whom is due the entire design and supervision of the structure. Messrs. Boller and Hodge are consulting engineers on the structural work. Mr. Charles G. Armstrong is the consulting engineer for the steam, electrical and sanitary work. The Foundation Co. of America had the foundation contract and Milliken Bros. the structural steel work.

City Investing Building.

The City Investing building which adjoins the Singer building and is shown in Figs. 1 and 2, also creates a record in its way, for it will be the tallest building which carries the main proportion of its area to its maximum height.

This building occupies the entire frontage of the south side of Cortlandt Street, between Broadway and Trinity Place, but owing to difficulties in obtaining the corner property at Broadway and also to the architectural treatment of the light shafts, which are recesses in the front of the building instead of the usual interior shafts, the plan of the building is singularly irregular. The main building rises

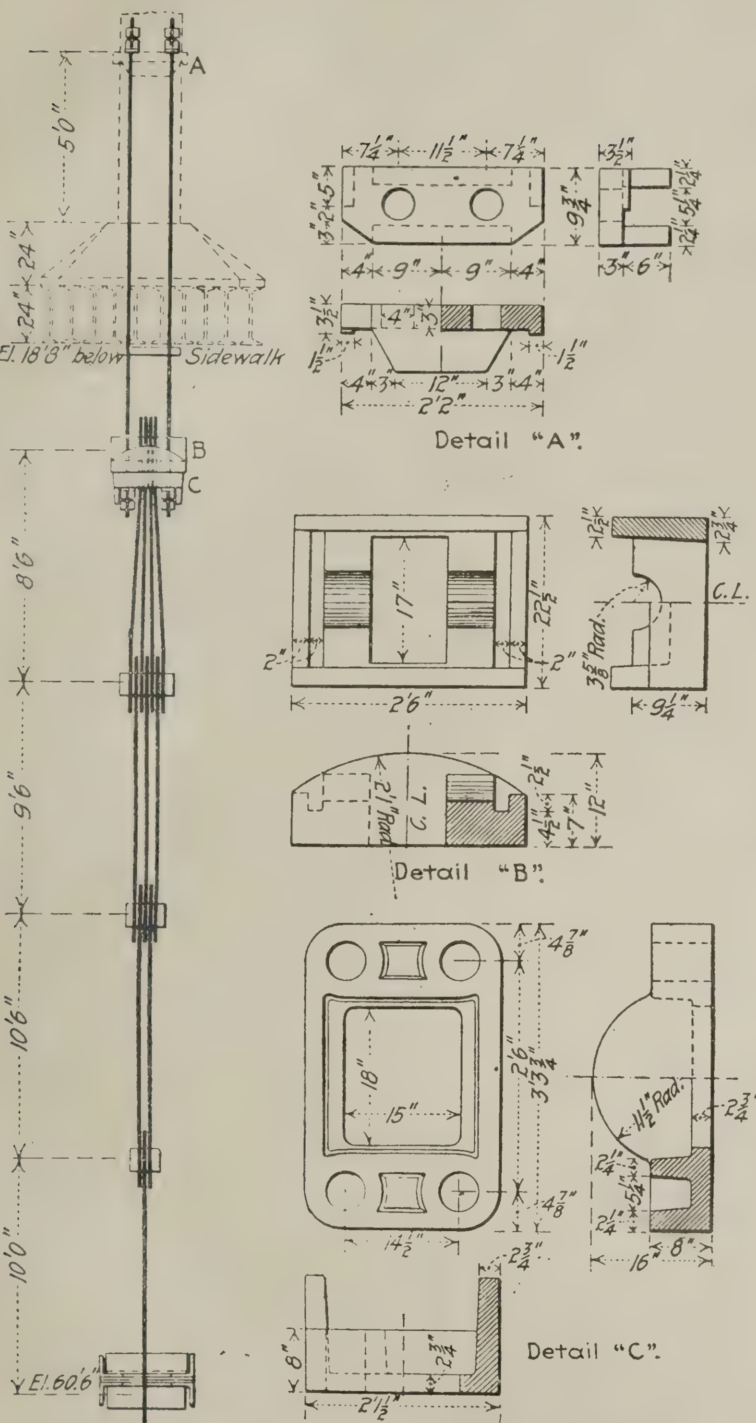


FIG. 8. ANCHORAGE ON SINGER BUILDING COLUMNS.

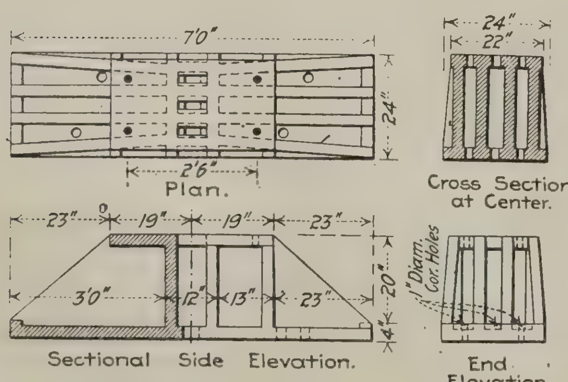


FIG. 6. CAST STEEL SHOE FOR COLUMN BASE IN SINGER BUILDING.

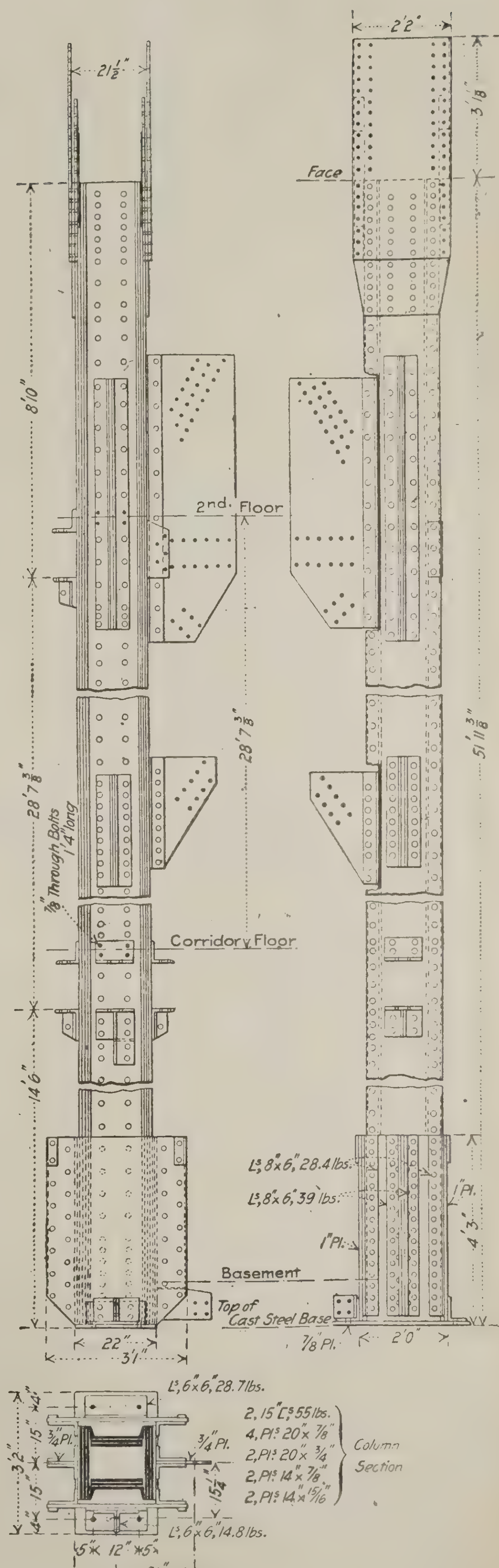


FIG. 7. TYPICAL COLUMN, SINGER BUILDING

to a height of 25 storeys, capped on the narrow Broadway front by a small tower, and that portion between the Cortlandt Street wings reaches, for a section about 70ft. square, to a height of 32 storeys, the last three storeys of which are in a sloping gable, rising about 400 ft. above the street. It is of the usual steel construction, faced with white stone for the first six stories and above that with white brick and terra-cotta trimmings.

The structural features of the building do not vary from ordinary practice in many instances.

The building is being erected, at an estimated cost of 10,000,000 dols. by the City Investing Co. of New York. The architect is Mr. Francis H. Kimball, the consulting structural engineers, Messrs. Weiskopf and Stern, and the general contractors the Hedden Construction Co. The O'Rourke Engineering Construction Co. put in the foundations and the steel work is being erected by Messrs. Post and McCord. The building is expected to be ready for occupancy by May next.

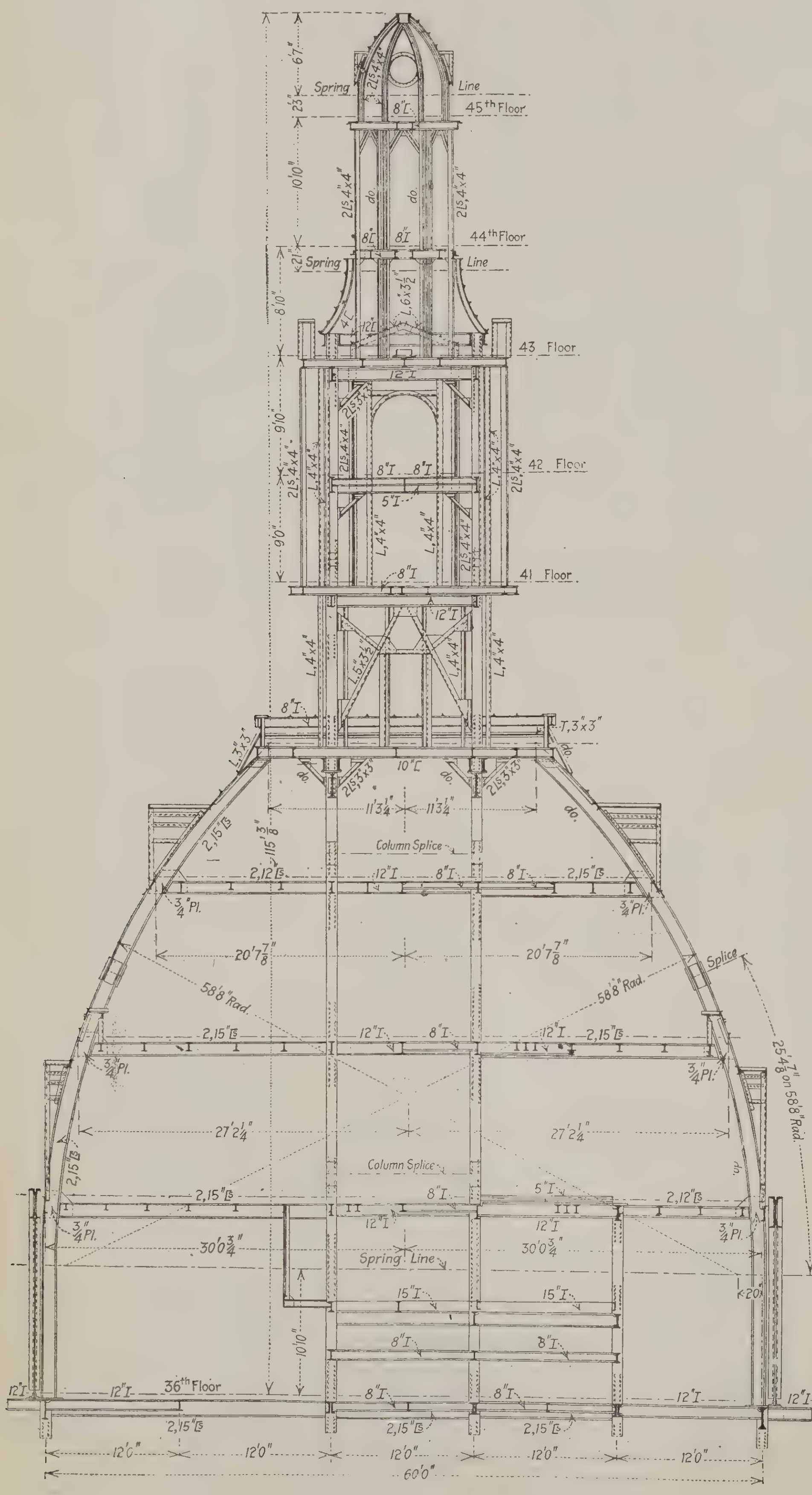


FIG. 9. ELEVATION OF CUPOLA OF SINGER BUILDING.

H.M.O.W., THE L.G.B. AND REINFORCED CONCRETE.

We reproduce below the interesting correspondence which has passed between H.M. Office of Works and the Council of Royal Institute of British Architects in reference to the durability of reinforced concrete structures, and the attitude of the Local Government Board when fixing the period for the repayment of loans on buildings constructed therewith to a shorter term than for structures of brick or stone. The Institute supports the protests which have been made against the Board's action and in the face of such testimony this Government department cannot stand much longer in the path of progress. The following is the correspondence:—

H.M. Office of Works,
Storey's Gate, S.W.
31st July, 1907.

Sir,—I am directed by the First Commissioner of His Majesty's Works, etc., to state that this department is informed that in the opinion of the Local Government Board buildings constructed in ferro-concrete are likely to prove less durable than those of bricks and mortar, and that that Board are re-arranging accordingly the rates at which money is to be advanced for the erection of the first-mentioned class of building.

In view of the foregoing I am to say that Mr. Harcourt would be much obliged if you will be good enough to favour him with the opinion of the Royal Institute of British Architects on the subject.—I am, Sir, your obedient servant,

(Signed) J. FITZGERALD.

The President R.I.B.A.

The foregoing letter was referred by the Council to the Science Standing Committee, and the Committee's report will be found embodied in the following reply of the Council:—

9th December, 1907.

To the Right Hon. Lewis Harcourt, M.P., First Commissioner of Works:—

Sir,—The Council of the Royal Institute have had under consideration the letter of the 31st July addressed by His Majesty's First Commissioner of Works to the President, stating that, in the opinion of the Local Government Board, buildings constructed of ferro-concrete are likely to prove less durable than those of bricks and mortar, and that the Board are, accordingly, rearranging the rates at which money is to be advanced for the erection of the first-named class of buildings, and requesting the opinion of the Royal Institute of British Architects thereon.

I am directed by my Council, who have adopted the report of the Science Standing Committee to whom the letter was referred, to write as follows:—

The First Commissioner of Works is no doubt aware that the extensive use of reinforced concrete and the exceedingly important part it plays in modern buildings led this Institute to appoint a Com-

mittee to consider and report on the subject, and to draw up regulations embodying the essential requirements for permanence and stability. The Institute invited the co-operation of other bodies in the work of investigation, and His Majesty's Admiralty, the War Office, the Institute of Builders, the District Surveyors' Association, and the Association of Municipal and County Engineers were also represented.

This Committee, of which Sir Henry Tanner, of His Majesty's Office of Works, was Chairman, Colonel Mayne, R.E., of the War Office, and Professor W. C. Unwin, F.R.S., Vice-Chairmen, after many meetings and discussions drew up a unanimous report setting forth the conditions under which reinforced concrete should be used, and found that under those conditions such work is trustworthy, and that decay of the metal is not to be feared.

This report was adopted at a General Meeting of the Institute specially called to consider it. A copy is sent herewith.

It is impossible to place before the First Commissioner of Works any report of the discussions of that Committee, but some observations on the relative durability may be permitted.

All materials are subject to decay by the influence of the weather, time, and use, bricks and mortar being no exception to the rule.

Improperly made bricks or mortar perish rapidly, and brick buildings are specially subject to fracture from unequal settlement of foundations, or the movements of the soil due to the alternation of wet and dry seasons.

Few buildings are constructed wholly in bricks and mortar; and the wood and iron employed for the floors, lintels, beams, and story-posts, etc., by their decay also produce further destruction.

The dilapidations due to these causes are brought before the architect every time he makes a survey of an old building, and the desire to increase the strength and durability of his work has led during the last fifty years or so to the employment of iron and concrete for floors, roofs, lintels, and other parts on a constantly increasing scale.

The development of this type of construction from simple uses for parts of buildings to its employment to-day for complete structures of all sorts, road and railway bridges, sewers, water mains, reservoirs, jetties, piles, dock walls, coast protection, warehouses, and other buildings, etc., by Governments, municipalities, railway and dock companies, and private owners has been slowly built up step by step by practice and experience, aided in later years by scientific research, which research in foreign countries has been largely undertaken by the initiative and at the expense of the State.

Concrete (largely employed by the Romans for buildings still existing) is employed to this day in great works requiring undoubted durability. As an instance, we may cite the dams for the reservoirs in the Elan Valley recently constructed for the Birmingham Corporation, work on a large scale which no one would rate as less durable than brick or masonry or indeed otherwise than having an indefinite length of life.

The old concrete had lime as a matrix. Concretes employed for reinforced concrete work are now universally made with Portland cement, a material which is no longer manufactured in an empirical manner, but prepared with all the care which chemical science and highly skilled technical knowledge can bring to bear on it. Its strength and durability are therefore greater and more reliable than heretofore.

Unsuitable material or unskilled preparation in concrete, as in brick or mortar, will undoubtedly lead to failure, but it is to be assumed that proper supervision during construction is employed in concrete structures as in brick, or iron, or steel.

It is sometimes thought that the metal may perish, but all experience shows that concrete is the best preservative for iron or steel known to us. A bar of iron or steel slightly rusty embedded in properly made concrete may be taken out after some months, or after hundreds of years, brighter than when it was put in. Perhaps I may quote an instance—the experience of Mr. Somers Clarke, late Surveyor to St. Paul's Cathedral, who, being anxious as to the condition of the great chain tie which binds the dome at its base, caused an opening to be made in the concrete in which it has been embedded for over two hundred years, and found the iron bright and perfect, notwithstanding the fears which had naturally been felt because of the percolation of water from the gallery over it. This is but one of many examples, showing not only that metal reinforcements and concrete have been used by architects for many years back, but that their confidence in the durability of concrete and metal in combination is justified.

The many instances of the anchor chains of suspension bridges being embedded in concrete as a provision against their deterioration through the action of moisture may also be cited as showing the reliance placed on concrete by engineers for the protection of steel from corrosion.

It is sometimes thought by those who have not studied the question that the lightness of reinforced concrete work, upon which its economy depends, and the small covering of the bars are dangers which time has not yet proved unreal. As showing its durability even in trying cases we may instance the inquiry made by the city of Grenoble in 1901 into the condition of the reinforced concrete water-pipes laid down by the city in 1886. These pipes at the date of the inquiry had been in use for fifteen years. They are 12 inches diameter, 1⅜ inch thick, with reinforcements of ¼-inch and 5-32-inch diameter. They have required no repair since made, having during that time resisted, and still resisting, without any fissuring or trace of oxidisation of the metal or flaw of any kind, a head of water of many feet.

There appears to us to be no more reason to doubt the durability of reinforced concrete in the walls, columns, floors, and roofs of buildings, and basement walls in damp situations, than in retaining walls, piled jetties, bridges, and other engineering structures.

There is also every reason to believe that it is as durable as brickwork or masonry for tanks, reservoirs, and similar structures, resisting the pressure of water under moderate heads, even if there be a slight sweating of water through the concrete, providing the metal is carefully embedded and thoroughly surrounded with concrete of a moderately wet consistency, and especially if the embedded metal has been washed over with a cement grout before being placed in it.

A still more severe test is afforded by works in sea water or works in tidal waters and by bridges, the piers and abutments of which are exposed to abrasion by running waters. Constructions such as these are more in the province of the engineer, but their behaviour and the opinions practically shown by engineers in ever increasing the use of reinforced concrete are evidences of which we take account.

Though innumerable buildings in England have parts, such as floors, roofs, and lintels, in reinforced concrete, comparatively few have been executed entirely in it, one reason being the difficulty of securing a good artistic result, and another reason that our building by-laws, which fix the thicknesses of walls in nearly all cities, towns, and urban districts, prescribe certain minimum thicknesses for concrete walls, and no reduction is allowed even if strengthened by steel reinforcements. Accordingly there is no advantage gained by the use of reinforced concrete for walls except in the case of railway and dock companies and Government departments not under the control of local authorities. Such bodies have built and are building largely in reinforced concrete.

My Council would call attention to this strange anomaly of public authorities, which employ an economical method of construction and yet practically debar the private citizen from also using it under powers which are conferred for the protection of the public interest.

The accidents and failures which have occurred in reinforced concrete works have not arisen from a want of durability, but have almost invariably taken place when the centres are struck, as, contrary to experience in other materials, the strength of concrete increases with age. Improper materials and imperfect design which produce failure after completion would equally produce failures in other materials.

My Council are of the opinion that works in reinforced concrete which comply with the requirements laid down in the Report of the Committee appointed by this Institute are at least as durable as brick or stone buildings. They think that any rearrangements of the rates, as suggested in the proposal of the Local Government Board which would limit the period of loans for reinforced concrete work to less than the period for brickwork would be a mistake, resulting in this country being largely debarred from the advantages of modern and more economic methods of construction employed, not only by foreign countries, but by bodies not requiring the consent of that Board or free from the control of building by-laws.—I have the honour to be, Sir, your obedient servant,

(Signed) W. J. LOCKE,
Secretary.

The following acknowledgment was received from the Hon. Sir Schomberg K. McDonnell, K.C.B., Secretary to H.M. Commissioners of Works and Public Buildings:—

H.M. Office of Works, etc.,
Storey's Gate, S.W.,
11th December, 1907.

Sir,—I am directed by the First Commissioner of His Majesty's Works, etc., to acknowledge the receipt of your letter of the 9th instant, and I am to express to the Council of the Royal Institute of British Architects the thanks of Mr. Harcourt for the valuable report upon reinforced concrete construction with which they have been good enough to furnish him.—I am, Sir, your obedient servant,

(Signed) SCHOMBERG K. MCDONNELL.

The Secretary R.I.B.A.

THE STADIUM AT THE FRANCO-BRITISH EXHIBITION.

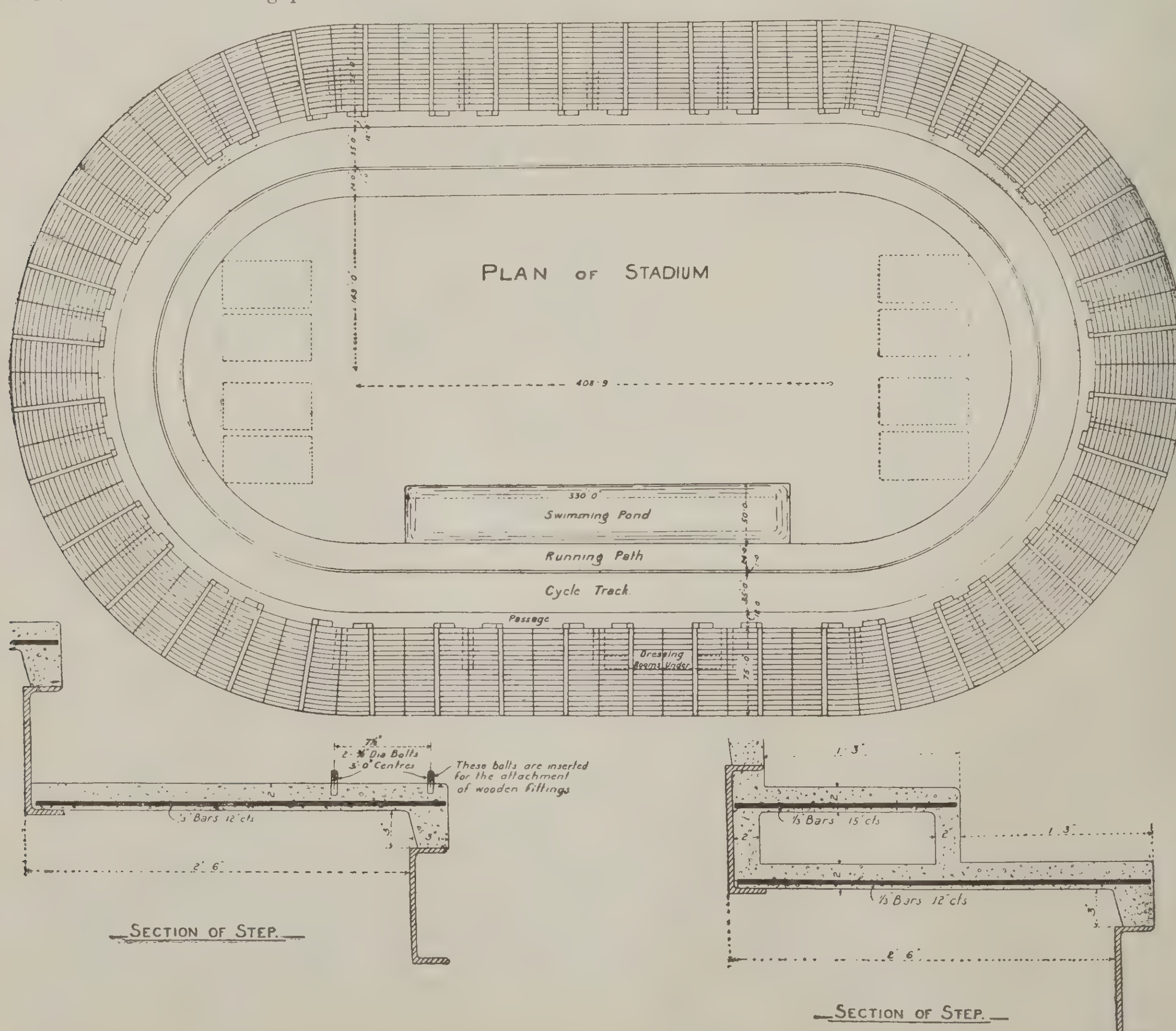
The Stadium is to be one of the principal features of the Franco-British Exhibition, which will be opened this year at Shepherd's Bush, London. In this Stadium the Olympic games are to be held. As will be seen from the plan here published, the building has two straight sides with circular ends. The over-all dimensions are 1,000ft. long by 594ft. wide. The seating and standing accommodation is 75ft. wide, and consists of 32 tiers for seats and 65 tiers for standing, the standing accommodation being at the circular ends of the building, while the seating is arranged along the sides. It will be capable of accommodating 150,000 persons. There is an open space 10ft. wide in front of the seats running round the building, from which there are numerous entrances and exits underneath the platforms, special entrances and accommodation being provided for royalty. Inside is a cycling track 30ft. wide, 660 yds. to the lap, ramped at the ends. Inside this again is a cinder running-track 25ft. wide, three laps to the mile. The central area is covered with fine grass turf and will be used for football and cricket matches, as also for tennis courts. A portion of this area, too, has been taken for a swimming tank, 330ft. long by 50ft. wide, which has been specially constructed for high diving, being 14ft. deep in the centre and 4ft. at the ends of the basin.

THE STADIUM AT THE FRANCO-BRITISH EXHIBITION, LONDON.

The tiers of seats and standing places are carried on 15ins. by 5ins. rolled steel joists, spaced 20ft. apart and supported by braced stanchions each constructed of two channel bars 5½ins. by 2½ins. braced on the side with flat lattice bars. There are also longitudinal and transverse braces of horizontal channels and diagonal flat bars. The stanchions are built securely to concrete foundations. The risers consist of channel bars 9ins. by 3ins., of varying weight according to the span, the latter increasing from the front at the curved ends. They are spaced from 2ft. 4ins. to 2ft. 6ins., according to the position, and are fixed to the stringers by means of forged stools.

The platforms are of reinforced concrete, averaging 2ins. thick. The reinforcement used is "Indented" bars one-third ins. square, spaced about 12ins. apart. The whole of the concrete has been laid in situ. The Empire Stone Co. were the contractors for the reinforced concrete work. Upon the concrete steps, timber lath seats will be fixed as desired.

The side of the building, i.e., where the seating accommodation is arranged, is roofed over by trusses 61ft. 8 ins. in span, with an over-hang of 17ft. 10½ins. The roof is covered with corrugated galvanised sheets. The space underneath the platforms are fitted out for the accommodation of competitors' dressing rooms, lavatories, offices, refreshment rooms and exhibit stalls for various goods appertaining to athletic games. The outside face will be covered with plaster work of an ornamental character.



THE STADIUM AT THE FRANCO-BRITISH EXHIBITION, LONDON.

THE CALCULATION OF THE STRESSES IN STEEL DOMES.

By Daniel West.

The consideration of the stresses in domed roofs of all kinds and the determination of the resistance of the structure thereto is a highly complex subject. Steel (and reinforced concrete) domes differ from others in one important respect. In all arched domes of brick, stone or concrete, the equilibrium line must be contained within the middle half of the section of the dome, or in other words, the dome section must approximate in shape to the line of least resistance for the particular conditions under consideration. This is all very well if the weight of the dome is considerably in excess of the maximum possible wind pressure, and if the thrust at the abutments is resisted by a proper tie or buttress and the abutments themselves do not settle. On the other hand it can be shown that steel domes economically covering large spans will abound in stability, if properly designed, even though their section differs widely from the line of least resistance.

This article is not intended to take the place of an exhaustive treatise on arches and arched domes, but merely to give a practical example of the comparatively simple calculations required to ascertain that the scantlings adopted in designing a steel dome are sufficient to ensure the safety of the structure without being unduly extravagant. Braced arches, such as the one shown in the diagrams are the most efficient and economical for large spans, as they give the structure great rigidity, and offer the maximum amount of resistance to the bending moment.

In the present example it is assumed that the dome covering is extremely light and that its weight, together with the weight of the principals, purlins, etc., may be taken as 56lbs. per ft. super of dome plan (measured on the horizontal plane). The addition to dead load which might be caused by snow lying on the dome surface would be provided for under the factor of safety for dead load. It is possible to calculate the effect of dead load on the structure with a considerable amount of accuracy and in practice this is often done, an ample allowance being made to provide for the weight of the roof itself, together with a considerable covering of snow and a further addition to the weight of the roof being made to cover ordinary wind pressures. It is, however, extremely important that the nature of the wind's action on the roof should be well understood and an approximate solution of sufficient accuracy for all practical purposes will be described later on. In calculating the effect of dead load it is assumed that the roof covering is carried on extremely light purlins resting over the junctions of struts with upper boom of truss. Each purlin carries half of the load between itself and the two nearest adjoining purlins, and each principal carries half of the load between itself and the two nearest adjoining principals.

The distance apart of the purlins decreases, on the horizontal plane, towards the springing of the dome, the purlins being spaced 2 ft. 10 ins. apart on the actual dome surface, while the distance apart of the principals increases as they approach the base of dome surface.

Multiply these two variables together at each point of support and then multiply by the dead load per foot super to obtain the actual dead load carried at that point of support.

The dead load carried at the points of support cd, de, ef, fg, etc., will be found to be 9 cwt., 11 cwt., 11 cwt., 10½ cwt., etc. The dead load at bc acts directly on to the abutment so that it need not be considered except as tending to counteract any tendency of the dome to exert an outward thrust at the base.

In the present instance it is assumed that at the apex of the dome there is a lantern weighing 1½ tons and each half truss will carry 4 cwt. (nearly) of this load, thus in the diagram 4 cwt. each must be added to the loads at jk and kl.

These data being given, it will be possible to proceed with the stress diagram, but before doing so one or two points require consideration.

The difficulty of predetermining the reactions of flat ended supports has led modern engineers to go in for pointed ends to their supports. In order to do this it is necessary to assume that the members bj_2 and $j_2\,k_2$ come to a point as indicated by the dotted lines in diagram. In the frame diagram for dead load only this point is assumed to be in the centre of the section at springing of arch and in the frame diagram for combined loads it is assumed to be at the outer edge of section line at springing level. In the latter case it will be found that if it be assumed, as is usually done in calculations for braced roofs, under dead load, that the reactions are vertical, the resultant stress diagram, for dead only, will show that the members h_2, k_2, $h_2\,j_2$, $j_2\,k_2$, $y\,k_2$, $y\,x$ and $x\,k_2$, are not strained at all.

It is evident, however, that, owing to the homogeneity of the lower boom of truss, part of the stress would be transmitted to the portions of the lower boom nearest the base, so this diagram must be misleading. A correct diagram, showing vertical reactions can be obtained, however, if the point of support be assumed to be midway between the flanges at springing level. This diagram would undoubtedly give the true stresses if the point of support were at the centre or inner edge of section at springing level and if the lower boom were not rigid.

The stress diagram obtained by the above method shows the greatest strain at the centre of the truss, as is always the case in girders whether braced or not, so that evidently it would act as a girder of the bowstring type with the greatest strain at the centre. In this case the upper boom is in compression and the lower boom in tension in accordance with the principle which applies to all girders.

But in the present case it is evident that the lower boom is perfectly homogeneous, apart from deflection, and the question arises whether a more correct result, from a practical point of view, cannot be arrived at by assuming an entirely different set of conditions.

Let it be assumed that in all steel arches of sufficient rigidity to resist the bending moment due to their section differing from the line of least resistance, the thrust and reaction at the abutment will be similar in amount and direction to the thrust and reaction of the equilibrium line. The resultant stress diagram will show that the horizontal thrust at the crown of arch comes within the middle half of section of dome and is equally divided between the upper and lower booms of truss at crown of arch. In this case the lower boom (being nearest to the line of least resistance) is in compression and the upper boom in tension. It can easily be shown by demonstration, that whether the point of support be taken at the centre of the section at springing level or at the outer or the inner edge of section the stress diagram will still satisfy the laws of arches by proving the thrust at centre of crown of arch comes in either case within the section of the dome at its crown, so that if the scantling of each member be made sufficient to withstand the stresses scaled off from the diagram, the dome will be in equilibrium as an arch, the greatest stresses being near the abutments instead of at the crown as was the case in the diagram obtained on the assumption that the reactions at the abutments are vertical. It will be noticed that if the thrust and reaction be equal in amount and direction to the thrust and reaction of the equilibrium line the greatest stress in any member will be only half of the greatest stress in any member if the reaction were vertical.

It is quite possible that in this case these two principles of the arch and the girder counteract each other to a certain extent and thus reduce the actual stresses to a minimum. However, this theory has not yet been demonstrated by the mathematicians, so for the present we must be content to design our scantlings of sufficient strength to resist the greatest stresses obtained by either method of calculation, not forgetting to guard against their failing as struts under compression through the ratio of length to radius of gyration being excessive.

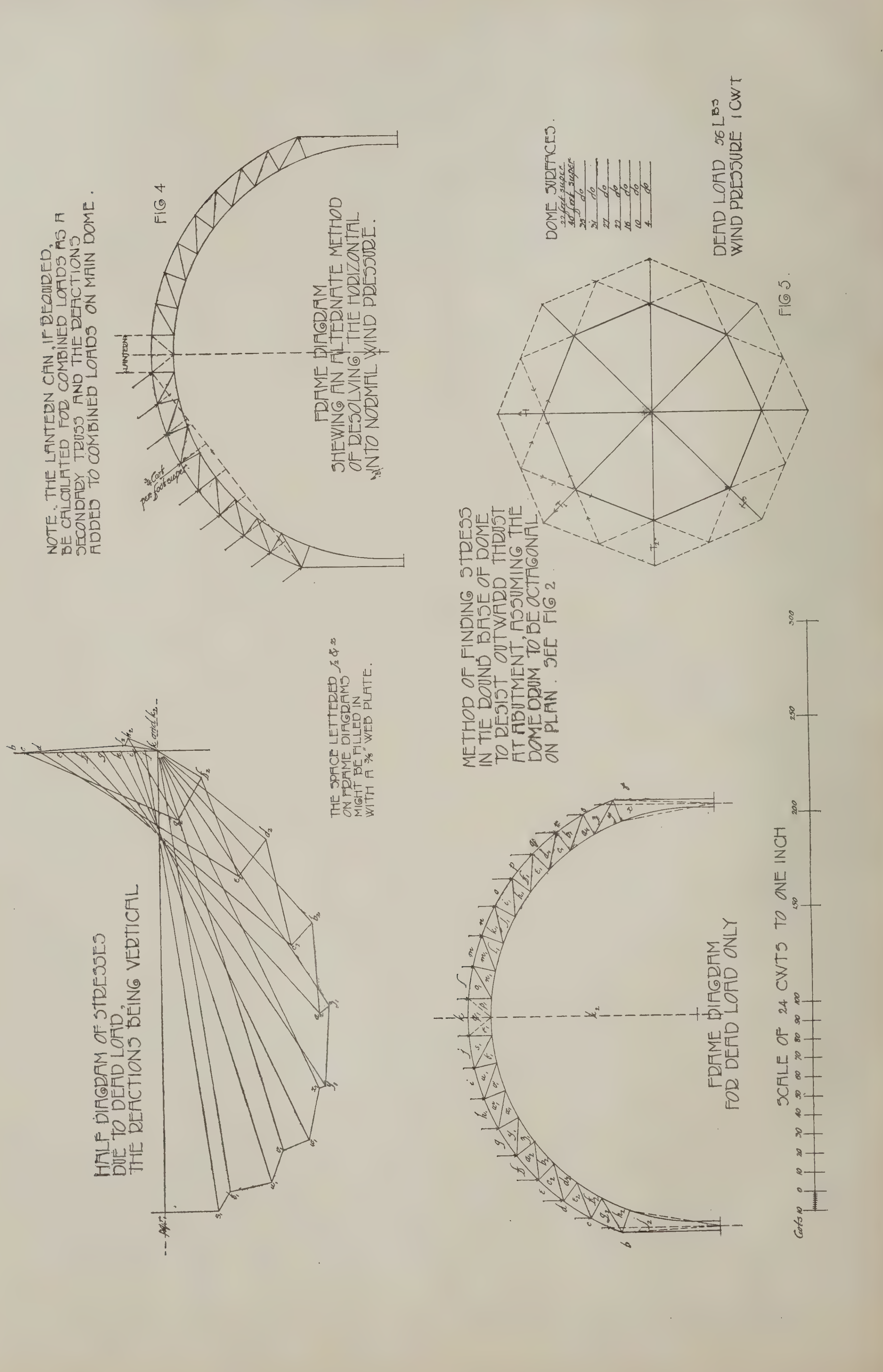
To draw the stress diagrams, the first thing to do is to set out the loads carried by the truss, including its own weight, to scale. In diagrams for dead load only, all the loads act vertically downward so the lines representing them to scale will all be vertical. Draw bc vertically downwards, representing to scale the load acting between the spaces b and c. Then draw cd, de, ef, fg, etc., representing the loads acting between the spaces cd, de, ef, etc., until all the loads are shown.

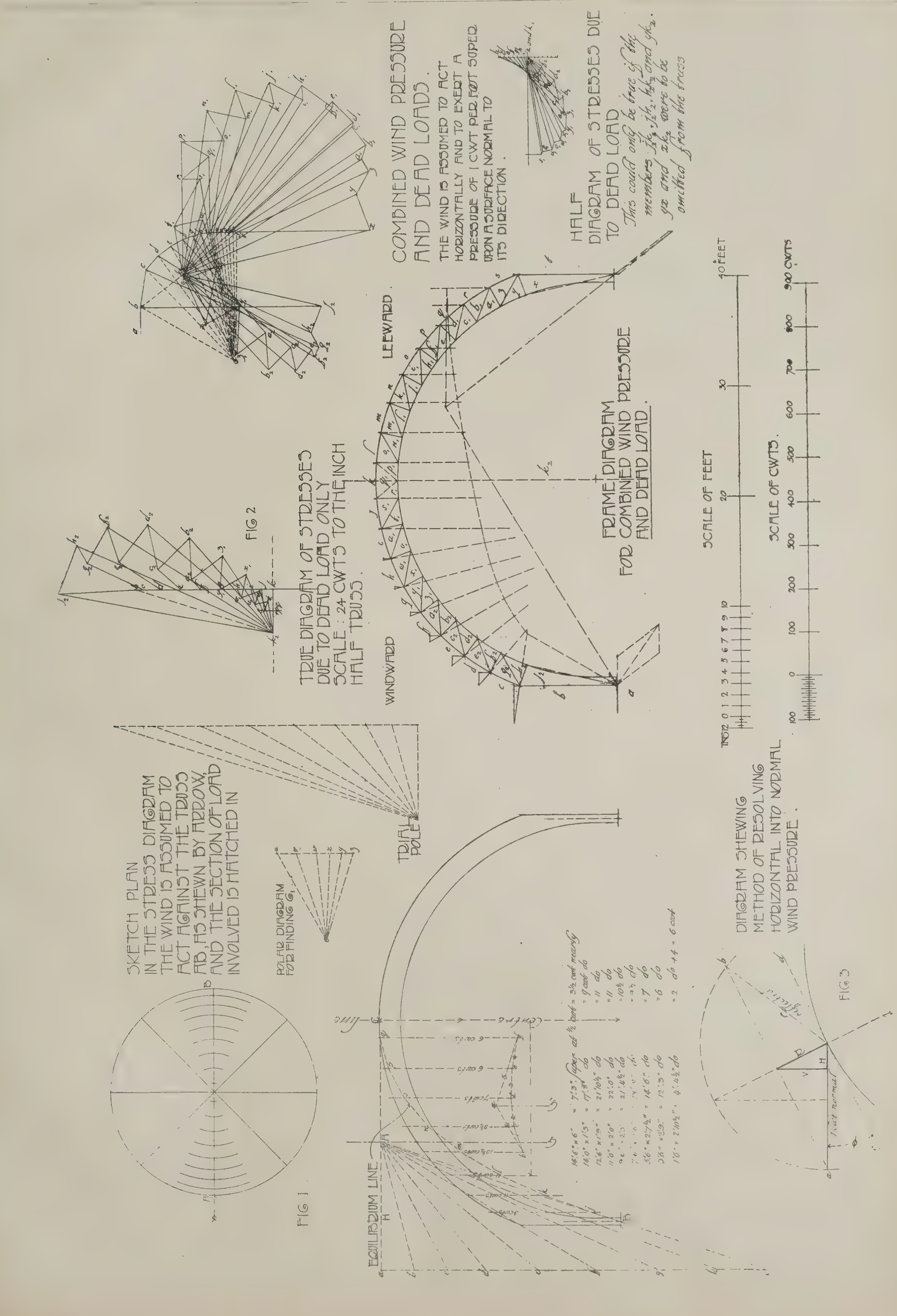
The total length of the line thus obtained will scale off the total load carried by the abutments and as the load is symmetrical, the reactions at the abutments will be equal and if the reactions are vertical they will react along the line already drawn until they meet at k, since the reactions are equal and bk is equal to tk.

If the reactions are not vertical, draw a line from b parallel to the reaction at the abutment between the spaces $b\,k_2$ until it meets a line drawn from t parallel to the reaction between t and k_2 (at the other abutment). The point where these two lines meet must be lettered k_2.

From b draw a line parallel to the member between the spaces b and j_2 (this line must be drawn parallel to the dotted line between b and j_2 in this case, as it is necessary to assume that the truss has pointed ends) until it meets a line drawn from k_2 parallel to the dotted line between k_2 and j_2 at the point j_2.

From the point j_2 in stress diagram draw a line parallel to the member between spaces j_2 and h_2 in frame diagram until it meets a line drawn from k_2 and parallel to the member between k_2 and h_2 at the point h_2 in stress diagram. Proceed in this way until the stress diagram is complete. It will be seen that the line between space s_1 and space lettered p_1, q_1, r_1 must be drawn until it meets the two lines between spaces k and p_1, q_1, r_1 and k_2 and p_1, q_1, r_1 respectively at the point p_1, q_1, r_1, after which the other half of the stress diagram


NOTE. THE LANTERN CAN, IF REQUIRED, BE CALCULATED FOR COMBINED LOADS AS A SECONDARY TRUSS AND THE REACTIONS ADDED TO COMBINED LOADS ON MAIN DOME.
FIG 4
LANTERN
¼ Cwt per foot super.
FRAME DIAGRAM SHEWING AN ALTERNATE METHOD OF RESOLVING THE HORIZONTAL INTO NORMAL WIND PRESSURE.
DOME SURFACES.
22 feet super
DEAD LOAD 56 LBS
WIND PRESSURE 1 CWT
FIG 5
METHOD OF FINDING STRESS IN TIE ROUND BASE OF DOME TO RESIST OUTWARD THRUST AT ABUTMENT, ASSUMING THE DOME DRUM TO BE OCTAGONAL ON PLAN. SEE FIG 2
THE SPACE LETTERED j_2 & z_2 ON FRAME DIAGRAMS MIGHT BE FILLED IN WITH A 3/8" WEB PLATE.
HALF DIAGRAM OF STRESSES DUE TO DEAD LOAD, THE REACTIONS BEING VERTICAL
FRAME DIAGRAM FOR DEAD LOAD ONLY
SCALE OF 24 CWTS TO ONE INCH


COMBINED WIND PRESSURE AND DEAD LOADS.
THE WIND IS ASSUMED TO ACT HORIZONTALLY AND TO EXERT A PRESSURE OF 1 CWT PER FOOT SUPER UPON A SURFACE NORMAL TO ITS DIRECTION.
HALF DIAGRAM OF STRESSES DUE TO DEAD LOAD
This could only be true if the members j_3k_2, j_2k_2, h_2k_2 and g_2k_2, g_2 and z_2k_2 were to be omitted from the truss
LEEWARD
WINDWARD
FIG 2
TRUE DIAGRAM OF STRESSES DUE TO DEAD LOAD ONLY SCALE: 24 CWTS TO THE INCH HALF TRUSS.
FRAME DIAGRAM FOR COMBINED WIND PRESSURE AND DEAD LOAD.
SCALE OF FEET
SCALE OF CWTS.
40 FEET
900 CWTS
SKETCH PLAN
IN THE STRESS DIAGRAM THE WIND IS ASSUMED TO ACT AGAINST THE TRUSS AB, AS SHEWN BY ARROW, AND THE SECTION OF LOAD INVOLVED IS HATCHED IN
FIG 1
POLAR DIAGRAM FOR FINDING G_1
TRIAL POLE
EQUILIBRIUM LINE
Centre line
DIAGRAM SHEWING METHOD OF RESOLVING HORIZONTAL INTO NORMAL WIND PRESSURE.
FIG 3

will be a duplicate of the half already drawn, as the load is symmetrically arranged.

It will also be seen that the dotted members p_1, q_1 and q_1, r_1 are not strained at all under dead load, but later on, when we come to draw the stress diagram due to combined wind pressure and dead load, it will be found that these members are necessary to complete same properly.

If the reactions under dead load are not vertical, it is necessary to ascertain their direction and amount before the stress diagram can be drawn.

As the sloping reactions have been assumed to be the same as the reactions of the equilibrium line, it is necessary to draw the equilibrium line and ascertain the nature of its reactions, and this can be done in several ways of which the best is probably that described in Molesworth's "Pocket Book of Engineering Formulae," as this method checks its own accuracy.

V = Versed sine of arch.

x = Abscissa measured horizontally from crown centre line to any point P.

w = Weight of arch and load supposed to be concentrated at any point P = $3\frac{1}{2}$ cwt., 9 cwt., 11 cwt., etc.

W = Sum of weights between crown and any point P.

m = Moments at each point P = w x.

M = Sum of moments between crown and P = m + m + etc.

g = Horizontal distance of centre of gravity (of portion of arch between crown and P) measured from crown = $\frac{M}{W}$.

y = Ditto ditto, measured from P = x − g.

H = Horizontal thrust of arch = $\frac{W\,y}{V}$ for symmetrical loads; = $\frac{Wy + W^1y^1}{2\,V}$ for unsymmetrical loads; when W y and W^1 y^1 are for the loaded and unloaded halves respectively.

k = Ordinate from tangent to line of equilibrium. The tangent will be horizontal for symmetrical loads and inclined for unsymmetrical loads. Obliquity determined by the formula $\frac{W\,y}{H}$

$$k = \frac{W\,y}{H}$$

To draw the equilibrium line proceed as follows:—

1st. Lay off from crown of arch tangent C a, making $k = \frac{W\,y.}{H}$

2nd. Find position of centre of gravity: $g = \frac{M.}{W}$

3rd. From A (the point of intersection of the vertical line passing through the centre of gravity) draw the horizontal line Aa = H to any convenient scale.

4th. Through a draw the vertical line a i, making a i = total load on half arch = W.

5th. On the line ai lay off ab, bc, cd, de = $3\frac{1}{2}$ cwt., 9 cwt., 11 cwt., 11 cwt., etc..

6th. Join bA, cA, dA, eA, etc., the length of these lines represent the intensity of stress on the lines drawn parallel to them.

7th. Draw to the intersection of the vertical lines of load Cq, qp, po, on, etc., parallel to Aa, Ab, Cc, Ae, etc., respectively, commenced at C.

The line ji should pass through the point B; this checks the accuracy of the calculation and drawing. The line Ai represents the thrust at the abutment, both in amount and direction.

Another method of finding the line of least resistance is by means of trial polar diagrams.

G represents the position of the centre of gravity of the half load. To find G_1, the centre of gravity of the loads between crown and the load of 11 cwt. nearest crown proceed as follows:—

Set out the loads $10\frac{1}{2}$ cwt., $9\frac{1}{2}$ cwt., 7 cwt., 6 cwt., and 6 cwt., acting vertically downwards. Take any point O, not in the line of loads and join Ou, Ov, Ow, Ox, Oy, and Oz.

In setting out the funicular polygon, draw the lines bc, cd, de, ef parallel to Ov, Ow, Ox and Oy respectively; from b and f draw the lines 6 and 5, respectively parallel to Ou and Oz, until they meet at a. Drop a perpendicular through a and this perpendicular will represent the position of G_1.

The problem of the combined action of the wind and dead load on the structure and how to measure the structure's resistance thereto is a complicated one and it is necessary to be content with approximating the solution.

Cloud motions are mainly horizontal, and although the wind bounds along according to the cycloidal principle of all motion, it may for all practical purposes be regarded as blowing horizontally, especially hurricanes, such as will produce a pressure of 1 cwt. per foot super normal to its direction.

In drawing the stress diagram for combined loads, it has been assumed that both ends of dome truss are fixed, and that the normal resultant of horizontal wind pressure is 1cwt. sin ρ, where sin ρ is the angle of inclination of roof, and this has been ascertained by the graphic method shown at Fig 3, where R = normal component and V and H = vertical and horizontal components of R. The normal component per foot super at each point must be ascertained and multiplied by the area of dome surface carried by the dome truss at that point. It has been assumed that the wind acts directly against one of the principals, and this principal and the section of load (hatched in on sketch plan) carried by it alone are dealt with.

It evident that this principal carries at least one third of the whole wind pressure on the dome, and if it be assumed that the two principals nearest to it also carry one third each, then the remaining principal (normal to the wind's direction) carries no load from wind pressure at all except what is transmitted along the purlins from the other principals.

Having found the amount and direction of the wind pressure at the different levels of dome surface and drawn same on frame diagram, the vertical pressures due to dead load must also be drawn on frame diagram and compounded with the wind pressures by means of the parallelogram of forces.

Now proceed to set down the loads to scale, drawing the horizontal line a b to represent the horizontal wind pressure at the abutment between spaces a and b, then draw b c, c d, d e, etc., to represent the resultant pressures obtained by compounding dead load and wind pressure. Beyond i j the wind will cease to exert any pressure, and the lines beyond this, j k, k l, etc., on to s t, will represent the dead load only, drawn vertically downwards to scale.

As the loads a b and s t both act directly on to the abutments, they may be neglected in determining the reactions due to the load. Draw a line from b to s to complete the polygon, then b s will represent the sum of the two reactions, both in amount and direction. In order to ascertain the proportion of the reactions at each abutment it is necessary to draw a funicular polygon. Commence by taking any point o outside the line of loads, and join o b, o c, o d, etc., on to o q, o r, and o s. Project all the load lines on frame diagram down as far as necessary, then start the funicular polygon at the left-hand abutment, as this is the windward side, by drawing a line from left hand abutment, parallel to line o b in polar diagram, until it meets the line of direction of load b c. Continue this line by drawing a line parallel to o c, until it meets line of direction of load c d, and continue the polygon in this manner till the load r s is reached.

Instead of continuing to s t with a line parallel to o s, it is necessary to continue with a line parallel to o s until this line meets the line of direction of the reaction at the right hand abutment, and as the direction of the reaction has already been found, it is easy to draw a line through the right hand abutment until it meets the line parallel to o s, which will have to turn backwards until it meets right hand reaction instead of going on to direction line s t.

From the point where this line and the right hand reaction meet, draw a line to the left hand abutment, and from o in polar diagram, draw a line parallel to it until it meets b s at k_2. Then b k_2 is the reaction at the left hand abutment, and k_2 s is the reaction at the right hand abutment. The stress diagram can now be proceeded with in the same way as the stress diagram of dead load only, and will be found to close with absolute accuracy, provided it be assumed that there are two ties p_1 q_1 and j_1 r_1 at crown, as shown by dotted lines.

Another method of converting the horizontal into normal pressure is shown in Fig. 4. This is sometimes adopted in approximate calculations, but cannot be considered to give such reliable results as the one previously described.

A tangent to the whole surface (on the section) exposed to wind pressure, is drawn, and its inclination to the horizontal will be found in this case to be roughly 35 degrees.

Then by the formula R = 1cwt. sin a $1.84 \cos a - 1$.

As the angle of inclination of roof is 35 degrees, this works out at .754 cwt., say $\frac{3}{4}$cwt. per foot super.

The wind pressure at each point of support is then represented to scale as $\frac{3}{4}$cwt., multiplied by the area of dome surface carried by that point of support, acting in a direction normal to the tangent line for the whole surface exposed to wind pressure. It is evident that this method is not nearly so accurate as the one last described but it is sometimes used for rough calculations, and no doubt gives some idea of the nature of the stresses set up by the unsymmetrical live load due to wind pressure.

If the theory be accepted that the dead load on the dome surface exerts a uniform outward thrust at the base of each half truss, some provision must be made to counteract the horizontal component of this outward thrust, and this can most easily be done by means of a steel tie round base of dome.

To ascertain the nature and amount of stress in this tie, let it be assumed that the plan of dome drum is octangular as shown

in Fig. 5, with scalloped intersections, with spherical dome surface. Let the lines T, T_1, T_2, T_3, represent the horizontal component of the thrust at the base of the dôme trusses. Draw parallelograms of forces with T, T_1, T_2, T_3, as the resultants and the sides of the dome produced as shown by dotted lines as components. It is known that T pushes outward, therefore the direction arrow of T can be put in and the other arrows round the triangles will follow in the same direction. A little consideration of the arrows will show that any component of the parallelograms, of which T, T_1, T_2, etc., are resultants, will scale off the stress in any one side of octangular dome plan, and that all the ties are in tension, for where two equal forces are pulling in opposite directions, the resultant tensional strain is equal in amount to one of the forces.

In this case the tension in the ties is only 31cwts., or about 1½ tons, the horizontal component of the outward thrust being 24 cwts., so that as steel will safely resist a tensile stress of 7½ tons per sq. in. of section, it is evident that a ½in. tie rod round base of dome would safely resist the outward thrust.

The unit of wind pressure adopted is excessive under the particular circumstances, so far as practical requirements are concerned, but even so it appears that the bars have none of them to endure a stress much above 20 tons, so that the heaviest member of this steel truss need not have sectional area exceeding (after deducting rivet holes), say, 3 or 4 inches.

The top and bottom booms might therefore be 2½ins. sectional area in one continuous bar, and this could be provided by a 3½in. by 3½in. by ½in. tee bar, with doubling plates to cover the stresses in the portions of upper and lower booms from d to h and from n to r. None of the lattices need be of a stronger section than 2ins. by 2ins. by ⅜in. L iron. The rivets should be in double shear; it is evident the strain on the rivets connecting lattices to booms will be very small.

Rivetted joints may fail in either of four ways, and their design must receive careful consideration in actual practice.

The effect of the purlins in tying the structure together is of the greatest importance, especially in steel domes, the ribs (or principals) of which consist of a single rolled steel joist under compression, in which case the distance apart of the purlins determines the value of l in the member in compression, where the ratio $\frac{l}{r}$ has to be taken into consideration. Moreover, the purlins are of value in transmitting some of the pressure from the windwardmost principal to its neighbours, as well as in carrying the dead load between the principals and in tending to resist the outward thrust at the different levels.

In the case under consideration in this article, it has been assumed that the purlins are just strong enough to carry their own dead load, and any resistance which they may offer to the outward thrust has been neglected.

The calculations necessary to show the stability of the dome or its resistance to the moment of wind pressure tending to overturn it are not necessary, as its stability in this respect is beyond question, but if it is desired to prove this, it can easily be done in the following manner: —

Find the resultant of all the horizontal components of wind pressure at different levels in the manner previously described for finding centre of gravity, then find the resultant of all the forces acting vertically downwards, due to wind pressure and dead lead. Produce these horizontal and vertical resultant pressures until they meet, then compound them by means of the parallelogram of forces and produce the resultant downwards until it meets base line of dome.

If this line of total resultant pressure meets the base line within the limits of dome, as it will be found to do, the dome is in stable equilibrium and cannot overturn.

In the stress diagrams all the members have been taken as being straight from point to point.

Where any members are curved the stresses in them as shown by the stress diagram, must be multiplied by the camber in the centre. This gives the bending moment to which the stress moments of the members under consideration must be equal, the line taken in the diagram being assumed to lie along the neutral axis.

In conclusion, it may be remarked that all domes of steel construction are braced arches as the tie round the base of dome takes the place of a tie directly joining the abutments.

Expansion problems have not been dealt with, as they hardly come within the scope of this article, and for all practical purposes it may be considered that the structure is self-adjusting.

Molesworth gives formulae for determining the strains on simple braced arches due to expansion.

REINFORCED CONCRETE CHIMNEYS.*

By Sanford E. Thompson, M.Am.Soc.C.E.

The first reinforced concrete chimney was built in 1898 by the Ransome and Smith Company for the Pacific Coast Borax Company, Bayonne, N.J. Since that time about 400 stacks have been completed, and these are distributed through nearly every state of the Union and Canada. These stacks range in height above ground from 50 to 352½ft., with inside diameter ranging from 4 to 18ft., the majority of them being 150 to 200ft. high and 5 to 6ft. in inside diameter.

Although the large majority of these chimneys have given satisfaction to their owners up to the present time, the failure of a few and serious cracks in several others have caused a number of enquiries to be made as to the reliability of reinforced concrete for chimney construction.

As a consequence of such questions your association has delegated the writer to investigate the causes of the faulty structures, and the condition of the chimneys now in service, with a view of reporting whether reinforced concrete may be safely recommended for chimney construction.

With this in view the writer has visited and carefully examined a number of concrete chimneys, has investigated the causes for the defects in these structures, and has consulted with representatives of some of the companies which make a specialty of this type of construction. From the rough inquiries made by your association and by personal correspondence direct reports have been received upon nearly 150 chimneys.

The results of this special investigation taken also in connection with two or three professional cases, in one of which opportunity was afforded for examination of the material in a chimney which was taken down, provide data for this report.

Conclusions.

It is thus possible to present quite definite conclusions and recommendations with reference to this class of construction. The general conclusions which follow will be considered in detail in subsequent portions of the report and reasons will be given for their adoption.

1. Reinforced concrete is a suitable material for chimney construction.
2. Reinforced chimneys must be designed and built upon the same principles and by the same methods which have proved essential in other types of reinforced concrete construction.
3. The defects and failures which have occurred in chimneys thus far built have been due to poor workmanship, or faulty design, or the use of the wrong concrete mixtures, or to all three.
4. The methods of construction at present being followed are in many cases defective and liable to lead to subsequent failures, and they should be radically modified.

Investigation of Chimneys.

As already intimated, several reinforced concrete chimneys have fallen, while being constructed or at some later period, and the cracks developed in a number of others have raised serious questions as to their safety. On the other hand, in general chimneys built of reinforced concrete have given perfect satisfaction, this being attested by the fact that in many cases the owners have repeated their orders for such stacks, one corporation, for example, having built fourteen of them at its plants in various parts of the country.

The question, then, which confronts us is whether the faulty structures reported are due to qualities inherent in reinforced concrete, or whether they are due to defects in design and methods of construction which may be amended in the future, or whether they may be considered simply as accidental failures to which all engineering structures are occasionally liable. In other words, shall we condemn the building of chimneys of reinforced concrete, or may we disregard the comparatively few actual failures as accidental or shall we approve of building concrete chimneys, at the same time insisting that, to be sure of permanence, the methods of design and construction must be in some cases radically changed?

My investigations and examinations of chimneys have led me very decidedly to the third alternative. In other words, the writer is convinced that reinforced concrete chimneys can be built which are entirely safe and practically indestructible while recognizing that many have been erected with an utter disregard of the fundamental principles which have proved essential in all other classes of reinforced concrete construction.

In the first place, as we consider the problem, two principles must be recognised which may be termed axioms in engineering science. Namely, failures do not necessarily throw doubt upon any class of construction unless the causes for failure are incapable of remedy. On the other hand, the fact that a structure or many structures have not failed is no proof that they are properly designed and built, since they may not have met with the most serious conditions or may be already stressed to a point so near breaking as to be liable to future deterioration from heat and frost and continued vibration.

To review the subject, therefore, the examination must be especially directed to

*Abstract of Report of Investigation made for the Association of American Portland Cement Manufacturers, and read as a paper before the fifth annual meeting of that body.

the causes of the occasional failures and defects reported, with the object of determining if possible whether the conditions which have produced the troubles may be present in other chimneys, and how they may be corrected in the future to prevent recurrence.

Eight cases have been reported in which chimneys have either blown over or have been taken down because they were defective, and ten or twelve others have been heard from in which cracks have developed which cause serious apprehension. In nearly every case of failure the chimney has been rebuilt by the construction company.

One of the failures most widely known is that which occurred at Peoria, Ill., in 1906. The chimney had been completed about three weeks when it gave way at the offset or projection, the upper part crumbling as it come down, and the concrete breaking into small chunks. The T-shaped steel stripped clean from the concrete. The cause is stated to be a poor batch of concrete at the offset, although the manner of failure would indicate that the concrete in the upper portion also was not of the best quality.

Another case is cited in which the chimney stood for nearly two years, and then blew over in a wind storm of about forty-five miles per hour. Here, as in the other case, the concrete stripped from the steel, and the fall was attributed to poor adhesion between concrete and steel.

A stack built in very cold weather in Canada blew over when the concrete, which evidently froze without setting, thawed out.

A case occurred in 1905 where the upper 30ft. broke and slid off while it was being topped off, the accident being charged to the fact that the mortar had not properly set.

This year a chimney in the west, after about two years' service, developed such cracks that it was considered dangerous and was taken down and replaced.

Another stack was torn down before the boilers were fired, because of defects in the workmanship.

The most recent failure occurred this last summer in Wisconsin, where a chimney blew over only two weeks after its completion in a severe tornado which damaged many other structures. The blame is laid upon the unusual severity of the storm and the freshness of the concrete.

Considering the chimneys which are now in commission, we find that in general they are subject to more or less checking or cracking. This need not necessarily condemn the structure, since the reinforcement may be sufficient to safely hold together the blocks formed by the cracks, and yet it would seem with the means we have of introducing steel wherever needed that all cracking ought to be averted, especially as there is always danger that the cracks may increase from wind vibration, heat and frost.

Our reports indicate in most cases that the cracks are not considered dangerous by the owners of the stacks. In several instances, however, long vertical cracks have appeared, and in others horizontal cracks have been found in the lower portion which have given serious concern. One chimney, straight when built, has since leaned about three to four inches from the vertical, beginning at a point about two-thirds way from the base. Another informant reports soft spots in his chimney.

Nearly 400 reinforced concrete chimneys have been built in this country, and direct reports have been received by your association and by the writer from nearly half of them. The failures cited amount to about 2 per cent. of the total number, with at least 2 to 3 per cent. more of doubtful safety; it is probable that most of the seriously defective cases have been brought to light since special care has been expended in running down doubtful ones. Of the others and even where personal examination has revealed somewhat serious cracks, the general verdict of the users is "satisfactory" and "good."

Reinforced concrete chimneys offer special structural difficulty, because of the heights to which they are carried, and the accompanying difficulty of obtaining the very best of workmanship. For this reason we might expect a somewhat higher percentage of error than in ordinary reinforced concrete construction. Even taking this into consideration, however, 4 per cent. appears to be a somewhat alarming percentage of defective construction. But the vital question is whether even these few cases may be passed over as isolated cases of defective construction, or whether they afford an arraignment of other chimneys now standing, and whether they predicate a similar percentage of defective construction in the future.

An examination by the writer of a chimney which was being taken down, if representative of others, throws considerable doubt upon their durability. On the other hand, it affords means for pointing out definitely the errors which must be guarded against in the future. This chimney showed soft spots in three of the sections, where the concrete could be readily loosened clear into the steel. The concrete was porous throughout, and scarcely bonded between the 6in. layers. Samples cut from good portions of the concrete—which was a mortar one part cement to three parts sand—gave an ultimate strength of about 1,200 pounds per square inch or about one-half the strength of a good 1.3 mortar laid with a sufficient quantity of water. A month after this inspection the chimney was taken down, the 6in. layers being readily loosened from each other and cut in pieces by a pneumatic chisel, and the concrete was found to vary materially in hardness. Of special importance was the fact that the mortar in the angles of the T-bars was weak and porous, showing scarcely any adhesion to the steel. Further investigation showed that the concrete, of mortar, used in the construction, was of such *extremely dry consistency* that even where well rammed, the moisture did not cover all parts of the surface of a layer, nor did it produce a proper bond with the steel.

From such evidence it is impossible to avoid the conclusion that other chimneys built by similar methods, with so dry a mixture as to give a weak, porous concrete and to provide insufficient adhesion to the steel, are likely to cause trouble in the future.

This appears to be a severe arraignment of concrete chimney construction. And yet, to be fair, it must not be overlooked for a moment that every one of the points brought out—the low strength of the concrete, the dry mix, the porosity, the lack of adhesion to steel, the lack of bond, and the soft spots—indicate construction which would not be tolerated in any other case of reinforced concrete work. It has been proved beyond a doubt, and reiterated in print and verbally, that reinforced concrete *must be mixed wet* in order to adhere to the steel and protect it from corrosion; that a factor of safety of four is certainly a minimum in compression; and that a concrete structure must be essentially monolithic. It should be clearly understood also that in the chimney to which the writer has just referred all of the essential elements were diregarded.

The defects noted are not inherent in chimney construction. In other words, from a practical standpoint, it is necessary to follow in chimney construction the methods which have been proved necessary for success in other structures made from reinforced concrete. As a proof of this we may simply point to the indisputable fact that concrete chimneys have been satisfactorily built with a proper factor of safety and with a wet mix which insures a positive bond to the steel, and with a dense concrete which protects the steel from corrosion and permits the bonding of the various parts of the structure.

Since reinforced concrete is everywhere being constructed on these principles, and is proving durable and satisfactory, and is being used under all conceivable conditions, we have ample cause for security in reinforced concrete chimneys provided they are properly designed and constructed.

Effect of Heat upon the Chimney.

In the above discussion the effect upon the chimney of the interior heat from the boilers is not directly referred to. Just what part this has played in the faults which we have noted is uncertain. Undoubtedly, the interior heat adds to the stress in the concrete, and thereby increases the tendency to crack, especially at points near the top of the inner lining. This simply indicates, however, that the quantity and arrangement of the steel reinforcement should be adapted to resist this extra stress.

When reinforced concrete was first introduced, it was questioned whether with changes in temperature the concrete and the steel would not expand and contract unequally, so as to make them separate from each other. If this were the case, it would be especially detrimental to a structure like a chimney, where the range in temperature is greater than usual. It has been proved conclusively, however, that concrete and steel have substantially the same coefficient of expansion, that is, with any degree of heat they expand and contract almost exactly alike. For this reason there can be no separation due to change in temperature.

The interior heat affects the shell in another way, because concrete is a poor conductor. The interior surface for a depth of an inch or two is heated very much hotter than the exterior surface, and so tends to expand and crack the colder outside surface. This effect is most marked upon a thick wall, the action being similar to that of a thick glass bottle which breaks more readily when hot water is poured into it than does one of thin glass. The stress or pull on the outside surface must be met by increasing the amount of circular steel and placing it near to this outside surface.

The effect of heat upon the concrete material itself is also a point which must be considered in chimney design. In the earliest chimneys built, the concrete lining extended the full height, while in later ones it has been generally carried up to about one-third the height. Usually the lining has been reinforced concrete, although in some cases firebrick has been used. A few chimneys have been built with no lining at all.

While much remains to be learned with reference to the effect of heat upon con-

crete, it is known to be a most excellent fire-resisting material, although it has been found that a temperature as high as 1,500 deg. Fahr. continued for only two or three hours will draw out the water of crystallisation so as to take out the strength for a depth of one-half to one inch. Lower temperatures affect the material less, and tests at the Watertown Arsenal indicate that a good cement mortar will not be appreciably injured at 600 deg. to 700 deg. Fahr. Tests of actual chimney temperature are extremely meagre, but from records available we may say that the temperature in an ordinary chimney seldom exceeds 700 deg. Fahr. at the base, while 400 deg. to 500 deg. is more usual. It is a fact not universally known among engineers that the temperature in a chimney remains quite high even in its upper portion. For example in the test of one chimney, the temperature at three-quarters of the height above the base ranged only 10 to 20 per cent. lower than at the flue. This makes it evident that if the lining extends only one-third of the way from the bottom, the design of the concrete shell above it should be adapted to resist considerable heat, while greater safety may be insured by extending the lining far above the lower third.

Your association has received no reports of injured linings. Many have never examined the interiors of their chimneys, but several have reported that the lining was in good condition. One correspondent states that after three months' use the interior surface of the chimney is "smooth, without cracks," and that "the soot does not adhere to the surface, but falls to the bottom or is carried out by the draught." Since the fire-resisting quality of concrete increases very greatly with age, it is fair to assume that if the interior surface is sound at the end of the first two or three months, it will not disintegrate after that time. Right in this connection Mr E. L. Ransome reports a recent examination of the inner shell of a chimney built nearly ten years ago of a true concrete of cement, sand and broken stone, in which he found the concrete in the hottest part of the chimney opposite the flue perfectly sound and exceptionally hard.

Concrete then may be considered as satisfactory for a lining or an inner shell in ordinary cases, although when exceptionally high temperatures are expected, say, above 750 deg. Fahr., it is on the side of safety to employ firebrick.

Principles of Design.

Having taken up the causes which have made trouble in the past, it now remains to definitely outline the principles which must be followed in design and also to enumerate the details of construction which in view of this past experience are essential in reinforced concrete chimneys, and which will warrant the adoption of this material as the standard for chimney construction.

A brick chimney stands because of its weight, the outside diameter at the base being made so large that it cannot blow over. The stress which comes upon the brickwork is, therefore, essentially compression. A reinforced concrete chimney is of such small size at the base that it would topple over when the wind blew if it were not held by the steel. The wind pressure causes compression on one side of the chimney (the side opposite the wind) and tension or pull upon the side against which the wind is blowing. To take this pull steel is embedded in the concrete, and when the concrete is properly laid, it bonds or adheres to the steel in such a way that they act together, just as they do in the bottom of a reinforced concrete floor.

The principles of design and allowable units for stress are discussed at length in the complete report, of which this is an abstract.

Construction.

However well the chimney may be designed, unless materials are of the best and properly put together and laid the chimney will be defective. In the complete report the rules for selecting materials and placing them are given in detail. The quality of the ingredients must be insured by thorough tests of the cement, the sand and the stone (if used). In the construction thorough mixing must be insisted upon, and of special importance is the use of sufficient water to produce a jelly-like "quaking" consistency when lightly rammed, so that the layers will bond together and the concrete will positively adhere to the steel.

Summary.

In closing, a recapitulation of the most essential requirements for reinforced concrete chimney design and construction may be made:

(1) Design the foundations according to the best engineering practice.

(2) Compute the dimensions and reinforcement in the chimney with conservative units of stress, providing a factor of safety in the concrete of not less than 4 or 5.

(3) Provide enough vertical steel to take all of the pull without exceeding 14,000 pounds, or at most, 16,000 pounds per square inch.

(4) Provide enough horizontal or circular steel to take the vertical shear (unless it does not exceed fifty pounds per square inch in the concrete) and to resist the tendency to expansion due to the interior heat.

(5) Distribute the horizontal steel by numerous small rods in preference to larger rods spaced farther apart.

(6) Specially reinforce sections where the thickness of the wall of the chimney is changed, or which are liable to marked changes of temperature

(7) Select first-class materials and thoroughly test them before and during the progress of the work.

(8) Mix the concrete thoroughly and provide enough water to produce a quaking concrete.

(9) Bond the layers of concrete together.

(10) Accurately place the steel.

(11) Place the concrete around the steel carefully, ramming it so thoroughly that it will slush against the steel and adhere at every point.

(12) Keep the forms rigid.

The fulfilment of these requirements will increase the cost of the structure, but if the recommendations are followed, there should be no difficulty in erecting concrete chimneys which will give thorough satisfaction and last for ever.

A NEW BAR.

A NEW BAR FOR REINFORCING CONCRETE, for the invention of which Mr. W. H. Brown, M.S.A., and Mr. Percy Tomey, C.E., are responsible, will shortly be placed on the market. The bar gives a mechanical bond throughout its length, and it has rigidly attached stirrups or shear members, the length and spacing of which are in no way limited, which do not project unduly and cannot be displaced by tamping the concrete. There are several novel features in its application to various circumstances which may be said to constitute a distinctive system. It can be used with equal advantage for beams, columns, piles, chimneys, walls, pipes, etc., and moreover, is manufactured at a very low cost. Further particulars can be obtained from Mr. Percy Tomey, at Queen Anne's Chambers, Westminster.

Views and Reviews.

Strength of Materials.

There are a good many books on this subject. Most of them are far more elaborate as regards recording of tests, describing the properties of materials, etc., but although this book is smaller, it covers the entire field well and is the best book we know of at present for engineering students. Earlier works will, of course, always have a value because they record the results of experience, but they are supplanted by this book in great part. Of recent years there has been considerable advance in the subject of applied mechanics and the strength of materials. Reinforced concrete, for instance, has shown many weak points in the theoretical treatment by the various authors of text-books. Beam action in reinforced concrete requires a more detailed knowledge of stress and strain than was required to deal with the steel beam, the material of which has approximately the same modulus of elasticity in compression as in tension. In order to provide for the needs of both class-room and laboratory, this book has been divided into two parts, the first part presenting the theoretical side of the subject and the second part its experimental side. The analytical treatment has been given a systematical development and the book is ably written so as to be easily intelligible. In Part II., which deals with the physical properties of materials, a separate chapter has been devoted to the subject of reinforced concrete and the information contained in the book upon this subject, notwithstanding its abbreviated form, is an admirable summary of principles, and may be read by students with advantage. There are still points which even this book treats inadequately. The theory of flat plates, especially as applied to reinforced concrete floor slabs is insufficient. Shear or diagonal tension in reinforced concrete and, in fact, the treatment generally of shear stresses on inclined planes is greatly in need of detailed treatment. We note, also, that Bernoulli's assumption that a cross section of a beam which was plane before flexure, remains plane after flexure, is adopted as a basis for the theoretical treatment of stresses in beams, although the authors add a footnote stating that the assumption is incorrect. The assumption is made because it is supposed to simplify the treatment of the subject; from that point of view it may be permissible in an article in a journal, or in a summary in a pocket book, but in a text-book of this character it is surely undesirable to mislead students by the use of such fallacious aids, which, although undoubtedly rendering diagrammatic representation easier, can really be avoided with little loss in respect to clearness and brevity, for it is only necessary, in most cases, to go so far as to assume simply that the stress in the fibres of a beam increases regularly with increasing distance from the neutral axis.

*"Text-book on the Strength of Materials," by S. E. Slocum, B.E., Ph.D., Professor of Applied Mathematics in the University of Cincinnati, and E. L. Hancock, M.S., Assistant Professor of Applied Mechanics in Purdue University. New York and London: Ginn and Co. Price 12s. 6d. net.

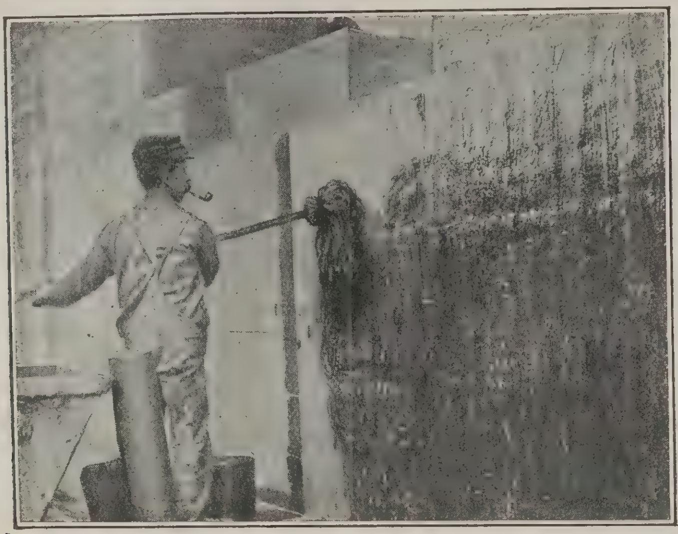


FIG. 1. APPLYING PITCH TO CONCRETE WALL.

WATERPROOFING CONCRETE.

In the United States sheet roofings have been favoured for many years for the water-proofing of concrete. Roofs built in conformity with the Barrett specification are to be found on many of the sky-scrapers of New York and elsewhere. Some of these roofs have been in existence for 30 years without needing repair. The Barrett Manufacturing Co. have now established an English branch at Spencer House, Finsbury, E.C., and as their manufactures are likely to be much in favour shortly, we think it advisable to briefly explain their systems of water-proofing concrete.

As regards the "Barrett specification" standard, slag or gravel roofing, this can be applied over boards or over concrete. In the former case the first layer consists of resin-sized sheathing paper, or of unsaturated felt. In the latter case the first layer is a coating of hot pitch applied to the smooth surface of the concrete. With boards, two full thicknesses of tarred felt are laid upon the rosin-sized paper, each sheet being lapped 17 ins. over the preceding one and nailed along the exposed edges of the sheets only so often as may be necessary to hold the sheets in place until the remaining felt can be applied. Upon these two layers of felt a coating of pitch is spread and then three thicknesses of tarred felt are applied, each sheet being lapped 22 ins. over the preceding one and nailed every 3 ft., not more than 10 ins. from the upper edge. When the felt is thus laid and secured, the sheets are lifted up and mopped back with pitch the full width of 22 ins. under the lap. The procedure in the case of concrete roofs differs only in the fact that the first two layers of felt are mopped with pitch between each in the same way as is done with the succeeding three layers. Finally over the entire surface of roofing a uniform coating of pitch is applied into which, while hot, is embedded slag or gravel. Another finishing often adopted is thin vitrified tiles or bricks, measuring 6 ins. by 9 ins. by 1 in. thick, instead of the slag or gravel. As regards the pitch of such roofs, the one usually adopted is 2 ins. rise in every foot. The pitch and the tarred felt are made with coal tar products of which the Barrett Manufacturing Co. are one of the largest manufacturers in the United States. The resistance of such pitch and tar has been proved by practice. No evaporation takes place and the flexibility and elasticity of the pitch is not injured by exposure to weather.

The water-proofing of vertical walls is carried out in a somewhat similar manner. In the United States the water-proofing of foundations is much more general than in this country. Not only the walls, but the layer of concrete over the site, forming the basement floor are alike water-proofed. We publish two views showing the manner in which basement walls are water-proofed, these particular views applying to the new power houses in course of construction in New York for the New York C. and H.R. Rail Road Co. In Fig. 1 the outer concrete wall is being coated with pitch Fig 2 shows a layer of tarred felt being applied on the pitch. Six layers of tarred felt are each cemented together with pitch, over which a final coat of pitch is applied. Upon this finally a coat of cement mortar about 1 in. thick was applied in order to protect the water-proofing from fracture, while the main concrete wall of the building was built up against it. A first layer of concrete was similarly covered with six coats of tarred felt and pitch, upon which the heavy concrete foundation was built, the water-proofing thus forming a continuous seal or lining over the entire floor and extending up the walls to a point above the water-line.

There is a tendency of recent years to favour sheet roofiings that can be applied in one layer instead of roofs like the Barrett standard roofing which are constructed in several layers. The demand for ready roofings in the United States has been due to the gradual depletion of the forests and the scarcity of timber resulting in the increased price of shingles. In the United States it was formerly the practice to use a good deal of tinned plate for covering roofs, but inferior quality in the modern product and the high price is against extensive use to-day. Slate is also considered costly. The Barrett Manufacturing Co. have met this demand by two roofings namely, "Amatite" and "Congo."

The "Amatite" roofing follows somewhat on the lines of the Barrett standard roof. It consists of two layers of tarred felt between which is a layer of pitch, and upon the top another layer of pitch into which is embedded finely crushed, hard, silicious rock. The flow of water on the steepest roof is insufficient to loosen these particles and the surface does not need paint to protect it from the weather. "Amatite" roofing is supplied in rolls containing 110 square ft., or ample to cover 100 sq. ft. of roof surface and allow for full 3 ins. laps. A special cement for applying between the laps and large headed nails are supplied free with each roll.

The "Congo" roofing is different. It has a smooth surface of slate-grey colour and looks like rubber. It contains nothing in its composition to contaminate water, so that water from a roof covered with "Congo" can be collected, or the material may be used for lining water tanks. It is supplied in four thicknesses, ½, 1, 2 and 3 ply, and is done up in rolls 36 ins. wide, each roll containing 216 sq. ft., sufficient to cover 200 sq. ft., and allow for a 2 in. lap. With each roll is supplied sufficient nails and tin caps and a special cement for applying between the laps and painting the seams and tin caps. It is elastic and pliable and there is no liability of it catching fire by any embers or sparks falling upon it. There is nothing in its composition to rot. It can be used on sloping or flat roofs and applied over old roofs. For reinforced concrete roofs "Congo" is an admirably suitable covering. The same material is also made up in the form of a damp-course for water-proofing foundation walls, cellars, etc.

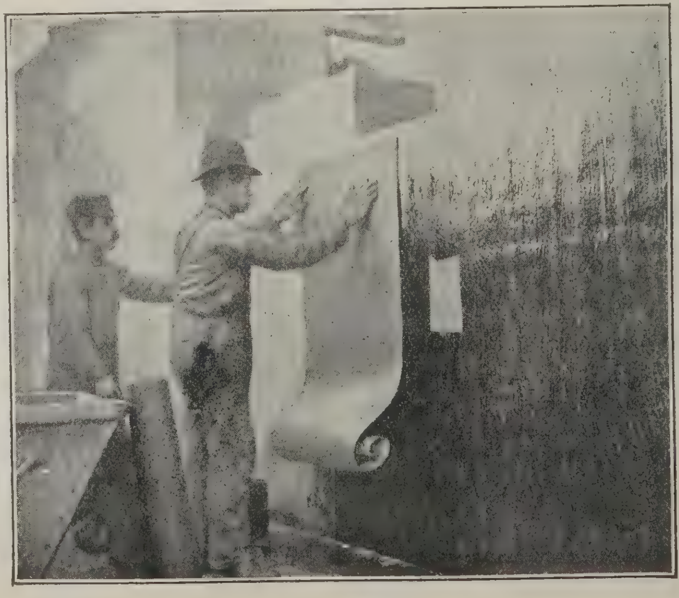


FIG. 2. APPLYING TARRED FELT ON PITCH.

Notes and News.

An Architectural Novelty in the shape of a church built entirely of paper is to be erected in the Roquette quarter of Eastern Paris. Seating accommodation for about 1,000 persons is to be provided.

* * *

A New Insurance Office.—The new building which has been completed in Euston Square for the London, Edinburgh and Glasgow Assurance Co. was formally opened last week. The architect is Prof. Beresford Pite, F.R.I.B.A.

* * *

The Old Delabole Slate Co., Ltd. (Cornwall), has recently supplied the slates for the Digbeth Institute, Birmingham (Mr. Arthur Harrison, F.R.I.B.A., architect), and the "Eton Memorial," at Eton (Messrs. Hall and Greenslade, A.R.I.B.A., architects).

* * *

The Old Guildhall at Norwich, having been declared unsafe, is to be pulled down. Much regret is felt in the town that it should be found necessary to demolish the old building. It was erected in the fifteenth century, but has been considerably altered from time to time. It still retains, however, in the Council Chamber the carved benches and arrangement of the aldermanic court of the Tudor period. The structure is of squared flints and freestone.

* * *

An Italian Tour.—Mr. J. Watson Cabré, winner of the travelling studentship given last year by the Liverpool Architectural Society, read a paper on his tour in Italy before last week's meeting of the Society. In seven and a half weeks, and at a travelling cost of about £40, Mr. Cabré visited the chief Italian cities, inspecting the finest examples of architecture and making numerous drawings, while he also gathered a large collection of architectural photographs. By reference to these he pointed out great beauties (and likewise not a few technical defects) in buildings of note, his outspoken remarks being received with much appreciation.—Prof. C. H. Reilly, who presided, pronounced the travelling studentship a success, and said the original drawings which Mr. Cabré had contributed to the Society's rooms would be of permanent value. He hoped that much more work on similar lines would be accomplished through the studentship, and that the Society might win the credit of having made known in England the work of some Italian architects of whom this country had far too little knowledge.

This is an old house which has recently been altered, the front not yet being quite completed. This house is in the occupation of the Architect, Sidney R. J. Smith, F.R.I.B.A., F.S.I.

Bankruptcies.

During the week ended January 24th twenty-two failures in the building and timber trades of England and Wales were gazetted.

H. Jones, builder, Northampton. R.O., Jan. 18.

G. H. Thomas, builder, Southend-on-Sea. R.O. Jan. 15.

G. Lancaster, builder, Kirkella. P.E., Hull C.C., Feb. 17 at 2.

F. C. Clarke, builder, Laindon. P.E., Shirehall, Chelmsford, Feb. 5, at 10.

T. Pye, speculative builder, Ecclesfield. Liabilities expected to rank for dividend, £1,750; deficiency, £1,597.

Banyard and Son, builders, Cambridge. Gross liabilities, £10,410; £3,559 expected to rank; deficiency £1,485.

H. Clark, builder, Portsmouth. First meeting, O.R.'s, Portsmouth, Jan. 29, at 3. P.E. Portsmouth C.C., Feb. 24, at 11. R.O., Jan. 17.

R. McClery, builder, Sancreed. First meeting O.R.'s, Truro, Jan. 20, at 12. P. E., Town Hall, Truro, Feb. 15, at 11.45. R.O. Jan. 13.

S. Chambers, builder and contractor, Swindon. First meeting, O.R.'s, Swindon, Jan. 31, at 3.30. P.E., Swindon C.C., Feb. 19, at 2.30. R.O., Jan. 15.

Robert Jenkinson and Sons, builders and contractors, Honley. Gross liabilities, £479; £472 expected to rank for dividend; assets, £83; deficiency, £389.

R. H. Tebb, architect, surveyor and property dealer, London, W. At last week's examination the Official Receiver reported that the assets were not of a value equal to 10s. in the £ on the liabilities. (The bankrupt put his liabilities at £65,000, and his assets at £78,000; but up to the present the assets have realised £807 only.) Discharge suspended for three years.

R. J. Worley, architect, Strand, London. At last week's examination it was stated that the claims admitted, amounted to £69,430. The assets, so far as they were not assigned to creditors wholly or partly secured, had been estimated to produce £24,467, but had up to the present time realized only £265. Nothing had been realised in respect of a surplus from securities, consisting of equities of redemption in freehold and leasehold properties estimated by the bankrupt to produce £20,514, and the trustee was unable to estimate the amount which would be received in respect of them. Discharge suspended for three years.

Tenders.

Duffryn.—Accepted for the erection of 40 houses for the Goodwick Building Club. Mr. H. Thomas, 9, Victoria Place, Haverfordwest, architect and surveyor.

Nicholas Bros. and Griffiths, Goodwick, £8,950.

Inverurie.—For supplying and laying about seven miles of cast-iron pipes, for the most part 8 in. diameter, including excavations, tanks, valves, and other relative works in connection with the Easterton scheme for the water supply of the Royal burgh of Inverurie, for the Corporation:

	£	s.	d.
Peattie and Wilson, Bo'ness ...	£9,141	9	9
Kirkwood, Kerr and Co., Glasgow	7,960	18	3
W. White and Co., Glasgow ...	7,893	5	5
R. McKay, Aberdeen	7,869	0	0
Henderson and Duncan, Edinburg	7,709	4	2
A. McKay, Aberdeen	7,636	5	0
W. Leask, Alford	7,172	1	6
W. Tawse, Aberdeen	6,991	16	8
J. Bryce, Whitburn	6,884	7	11
D. Y. Stewart and Co., Glasgow	6,827	16	9
R. C. Brebner and Co., Edinburgh	6,825	4	0
R. C. Crawford, Uddingston ...	6,789	5	2
J. Kinniburgh, Glasgow ...	6,727	11	6
W. Jackson, Edinburgh ...	6,710	15	0
J. McConnachie, Huntly ...	6,566	13	9
J. Laing and Sons, Inverurie*	6,489	0	0

*Accepted with an addition of 5s. 6d. per cubic yard for solid rock cutting.

Overton (Hants.).—For the erection of Overton Church tower:—

	£	s.	d.
R. Bridgeman, Lichfield ...	£2,543	10	0
Barnett and Sons, Overton ...	2,514	0	0

	£	s.	d.
Coston and Co., Southampton	£2,438	0	0
Golding and Ansell, Southampton	2,390	0	0
Avery Bros., Winchester	2,354	0	0
Merrick and Sons, Glastonbury	2,297	0	0
Jenkins and Sons, Southampton	2,295	0	0
H. Mundy, Basingstoke	2,274	0	0
Grace and Sons, Clatford	2,262	0	0
J. Harris, Basingstoke	2,224	15	0
J. J. Wise, Winchester	2,212	0	0
Collins and Godfrey, Tewkesbury	2,167	0	0
E. Preece, Bristol	2,097	0	0
Chick, Carden and Co., Highworth	2,088	9	9
Musellwhite and Sapp, Basingstoke	2,038	0	0
E. Kersley*, Overton	2,030	0	0
Goodall and Sons, Basingstoke	1,999	0	0
G. Franklin, Southampton	1,993	0	0

*Accepted.

Parkstone (Dorset).—For the erection of four shops with residences, etc., in Bournemouth Road, Parkstone, for Mr. John J. Norton. Messrs. Smart and Wyeth, Bank Chambers, architects, 220, Ashley Road, Parkstone:—

	£	s.	d.
Aldridge	£2,665	5	3
W. C. Crane, Poole	2,570	0	0
Baker and Pearcey	2,431	0	0
J. Hillman	2,476	19	0
J. and A. Steane Bros., Bournemouth	2,448	0	0
T. C. Regler, Poole	2,300	0	0
H. W. King, Bournemouth	2,285	0	0
A. E. Rogers* Rest of Parkstone.	2,200	0	0

*Accepted.

Our Plate.

The detail of the ceiling in the chapel of S. Domenico in the church of SS. Giovanni e Paolo, Venice, which we give as a centre plate this week, is a very rich piece of work in plaster. The colour—on which it depends so much for its effect—is, of course, missing, but the design in itself is beautifully treated, the cartouch in the sprandel especially so: and as such it has much interest for all who can appreciate architectural work of quality.

New Companies.

C. M. Hughes and Son, builders, merchants, and general contractors, 21, Strand, Liverpool. Partnership for five years from January 1. General partner: R. A. Hughes, 5, Ashbourne Avenue, Blundellsands, Liverpool. Limited partner: C. M. Hughes, same address, contributing £500 (£80 cash, £50 plant, £220 stock, and £150 book debts).

New Aberystwyth Brick Co., to adopt an agreement with J. Osman and Co., Ltd., and H. Slee, and to carry on the business of manufacturers of bricks, tiles, pipes, tera-cotta and ceramic ware, etc., Aberystwyth. Capital: £3,000.

Coming Events.

Monday, February 3.

Royal Institute of British Architects.—Address to students by Prof. W. R. Lethaby, F.R.I.B.A. Presentation of prizes.

Liverpool Architectural Society.—Mr. Henry T. Hare, F.R.I.B.A., on "The Planning of Public Libraries."

Surveyors' Institution. — Junior meeting, at 7 p.m.

Wednesday, February 5.

Northern Architectural Association. — Conversazione, at 7.30 p.m.

Wednesday, February 5.

Manchester Society of Architects (Club night).—Paper by Mr. Potter, at 6.30 p.m.

Edinburgh Architectural Association.—Mr. A. R. Myers, A.R.I.B.A, on "Notes on Materials."

Northern Architectural Association.—Conversazione and Exhibition of Drawings and Sketches.

Thursday, February 6.

Royal Sanitary Institute.—Public meeting to inaugurate Congress at Cardiff.

Friday, February 7.

Architectural Association. — Mr. C. Harrison Townsend, F.R.I.B.A., on "Garages and Motor Houses," at 7.30 p.m.

PROPOSED COTTAGES AT HARROW: SMITH AND RACKHAM, ARCHITECTS.

These cottages are estimated to cost about £400 (at 5d. per cubic ft.). The Architects are Messrs. T. G. Smith and P. C. Rackham, of Barnsbury, London, N.

Monday, February 10.

L.C.C. School of Building (Ferndale Road, Brixton).—Prof. Beresford Pite, F.R.I.B.A., on "Panellings and Framings," at 7.30 p.m.

Glasgow Institute of Architects.—Joint lecture with architectural section Royal Philosophical Society, Glasgow.

Surveyors' Institution.—Ordinary general meeting, at 8 p.m.

Wednesday, February 12.

Architectural Association.—Mr. Percy J. Waldram, F.S.I., on "Suggestions as to how the Architect and Engineer can Combine."

Edinburgh Architectural Association. — Mr. Moritz Kahn on "The Practical Side of Reinforced Concrete."

Northern Architectural Association.—Paper by Mr. Joseph Oswald, F.R.I.B.A., at 7.30 p.m.

Thursday, February 13.

Leeds and Yorkshire Architectural Society.—Mr. T. H. Mawson, Hon.A.R.I.B.A., on "English and Italian Garden Architecture."

Manchester Society of Architects.—Prof. C. H. Reilly, M.A., A.R.I.B.A, on "The Grand Manner in Architecture," at 6.30 p.m.

Society of Architects.—Mr. G. Topham Forrest on "School Planning."

Sheffield Society of Architects and Surveyors. —Mr. Moritz Kahn on "The Practical Side of Reinforced Concrete."

Friday, February 14.

Birmingham Architectural Association.—Mr. E. F. Reynolds on "Architecture, East and West."

Edinburgh Architectural Association.—Associates' Annual Dinner.

Glasgow Technical College Architectural Craftsmen's Society.—Mr. Dugald M'Kellar on "Building as it is generally done."

Monday, February 17.

Royal Institute of British Architects. — Mr. Francis Fox, M.Inst.C.E., on "Foundations, the Use of Divers, and the Grouting Machine."

Liverpool Architectural Society.—Mr. E. Willoughby Faulkner on "Holland."

Tuesday, February 18.

Institution of Heating and Ventilating Engineers.—Annual General Meeting, Institution of Mechanical Engineers, Storey's Gate, Westminster, at 6.30 p.m. Mr. W. Nelson Haden, J.P., M.I.M.E., on "The Heating and Ventilation of School Buildings." Mr. W. H. Casmey on "Warming and Ventilation."

Wednesday, February 19.

Architectural Association (Camera and Cycling Club).—Prof. Beresford Pite, F.R.I.B.A., on "Domed Churches," at 7.30 p.m.

Edinburgh Architectural Association.—Mr. J. Campbell Mitchell, A.R.S.A., on "Colour."

Glasgow Institute of Architects.—General meeting, at 2 p.m.

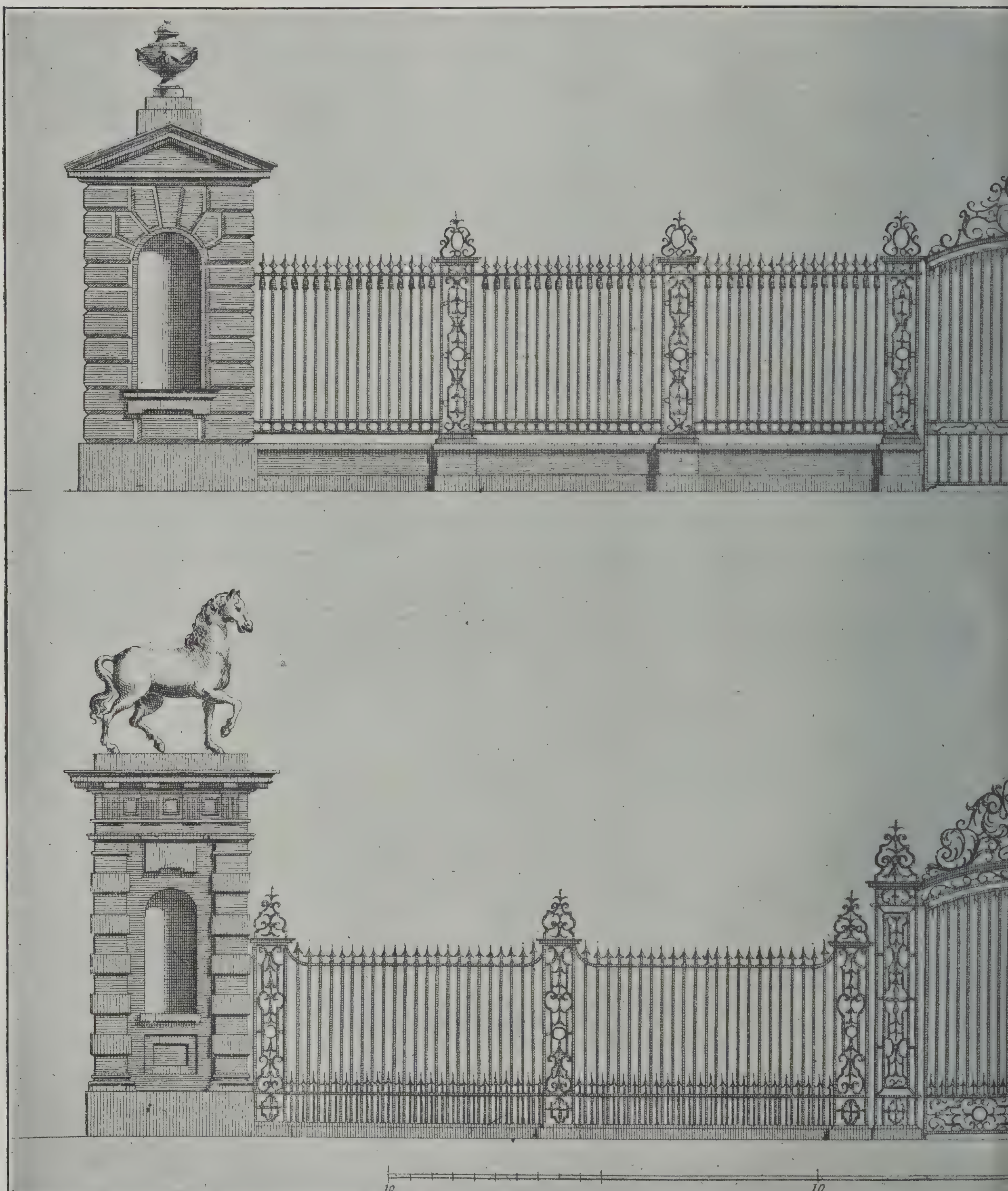
Thursday, February 20.

Leeds and Yorkshire Architectural Society.—Sir Charles Nicholson, Bart., M.A., F.R.I.B.A., (subject to be announced later).

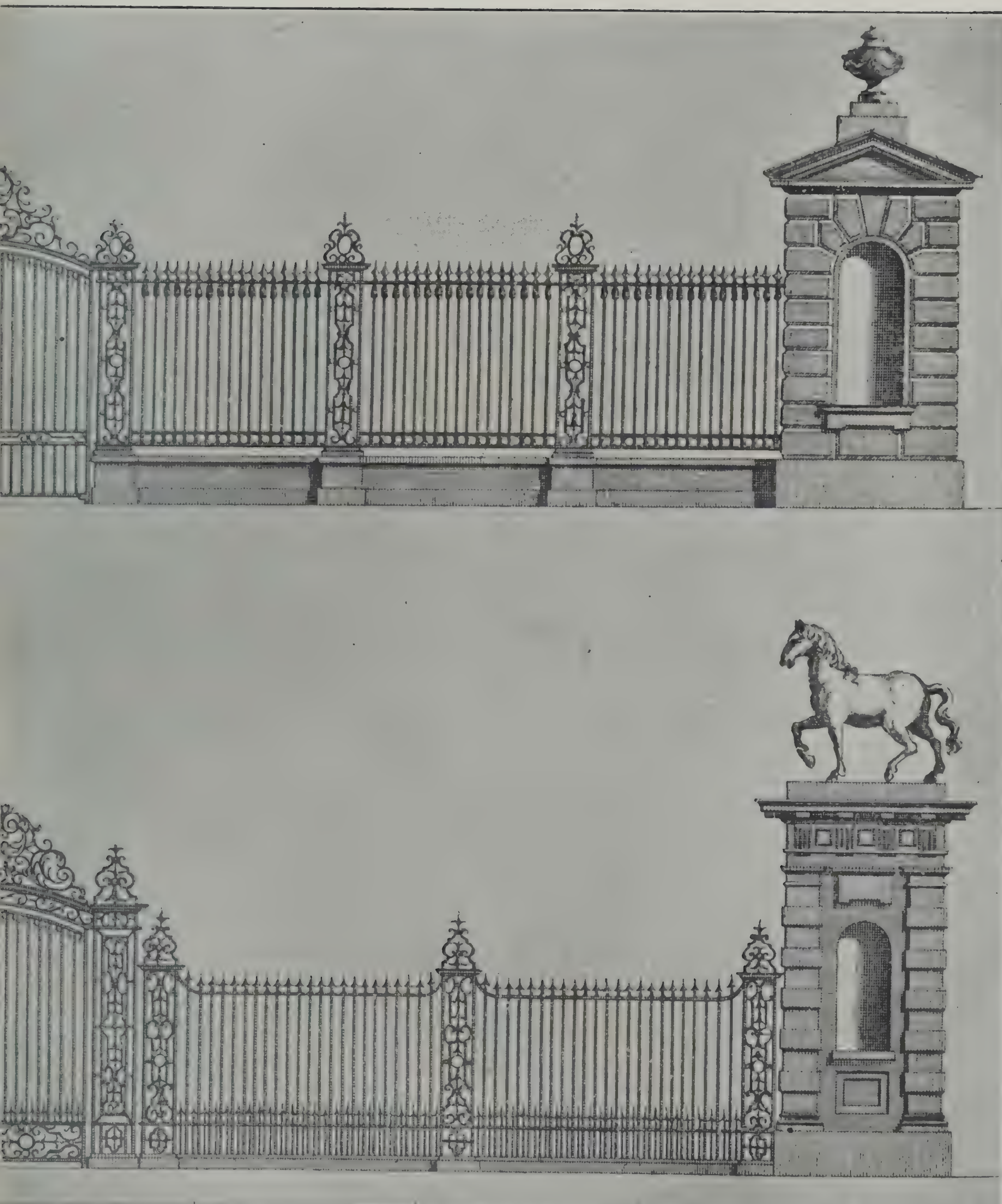
Friday, February 21.

Architectural Association.—Mr. Edward Warren, F.R.I.B.A., on "Oxford."

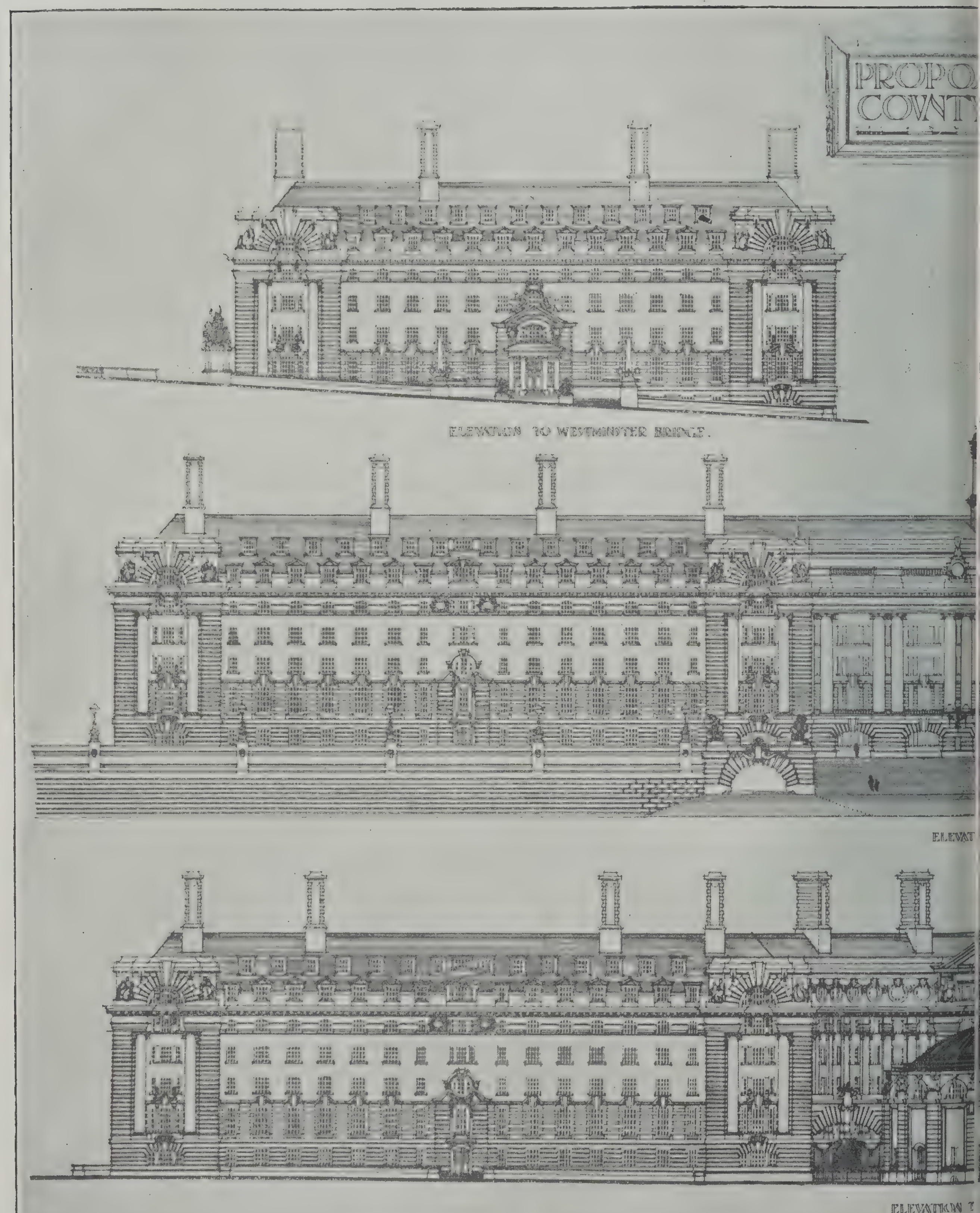
Institution of Mechanical Engineers.—Annual General Meting, at 8 p.m.



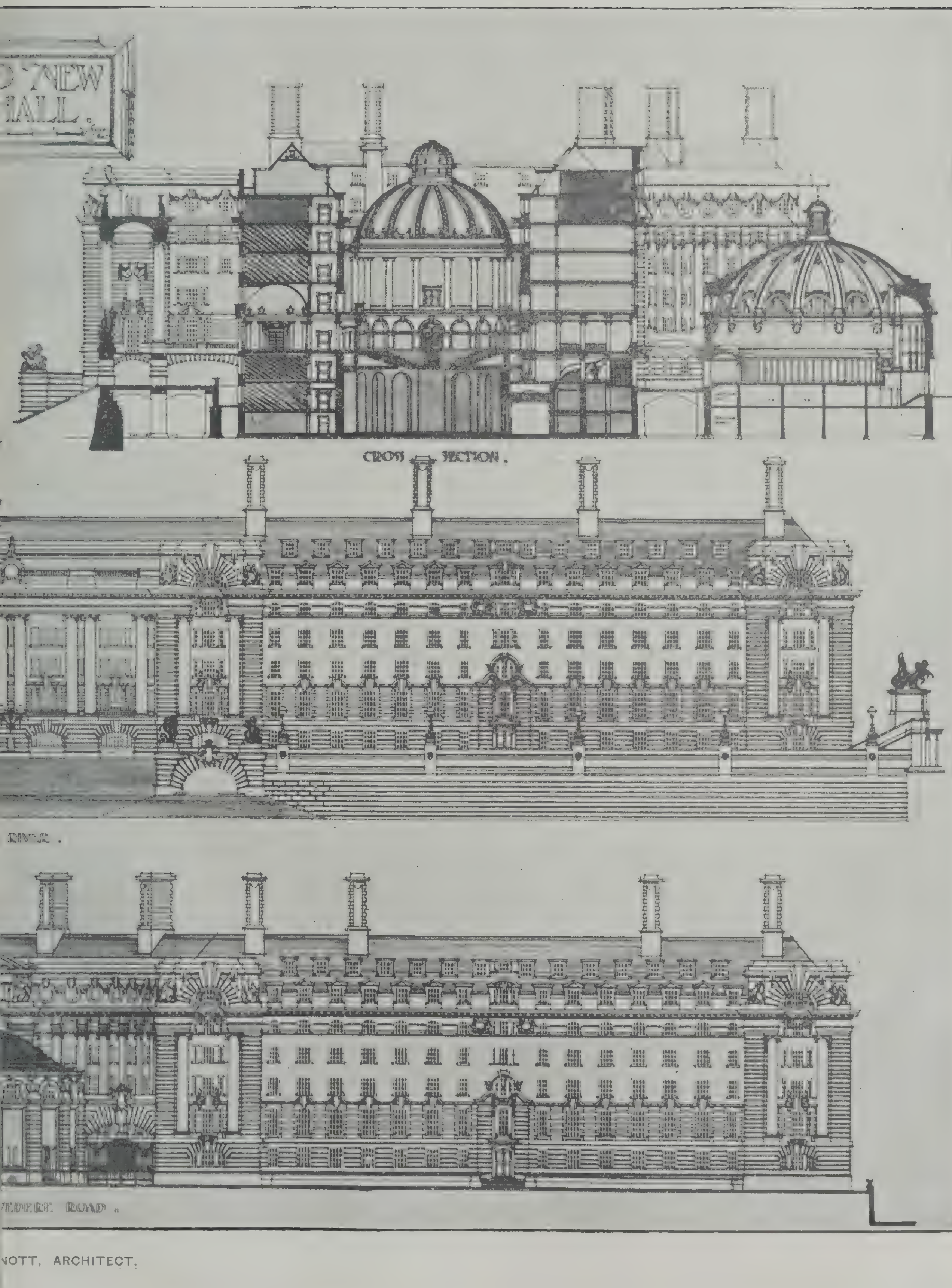
TWO DESIGNS FOR GATES AND RAILINGS WI



ONE PIERS. JAMES GIBBS, ARCHITECT.



SELECTED DESIGN. RA



NOTT, ARCHITECT.

February 5, 1908. Volume 27, No. 678.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

Notices.

Offices : Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address : "Buildable, London."

Telephone : 364, Westminster.

Date of Publication : The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The "Contractors' Section," is given in this Issue.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

The Marble Arch Improvement Scheme.

In our issue of last week we gave some particulars of the scheme for the improvements at the Marble Arch, which was finally and unanimously adopted by the London County Council at its meeting held on January 28th. Lord Elcho, as Chairman of the Marble Arch Improvement Committee, in moving the adoption of his committee's report, stated that the scheme now presented was one which would not only afford great relief to the traffic of a most congested district, but would also be an improvement to London "from the aesthetic point of view." Whilst we are thoroughly in accord with the views expressed by Lord Elcho as to the public utility of the proposals embodied in the committee's report, we must speak in more measured terms of the opinion given as to the artistic value of the proposal. As our readers are aware, the originator of the scheme, Mr. F. W. Speaight (to whom Lord Elcho, on behalf of the London County Council, cordially acknowledged their indebtedness), has devoted much time and money to its realisation. Mr. Speaight's original proposal was that a fine open *place*, 420 feet wide and 200 feet deep, should be formed immediately behind the Marble Arch on a portion of the land at present enclosed by the park railings, and that the *place* so formed should be separated from the park by a new crescent screen of a quiet but dignified architectural character. Mr. Speaight claimed that if this scheme were carried out "all the traffic to and from Paddington, via Park Lane and the Edgware Road, would be able to take a direct line by passing at the back of the Arch instead of in front of it," and that it would also allow the traffic leaving the park to branch off to the right or left without having first to come, as is the case at present, in front of the Arch. This well-considered, extremely able, and architecturally attractive solution of the problem connected with the traffic of one of the most crowded points in London has been set aside, we are sorry to learn, in favour of a modified arrangement. The plan thus altered still provides, it is true, a workable scheme for dealing with the congested street traffic brought about by the converging roads in the vicinity of the Arch, but unfortunately it is one that is altogether devoid of any architectural interest. It includes the formation of a new carriage-way on the south side of the Marble Arch 70 ft. wide, provided by means of additional land taken from Hyde Park. Undoubtedly the scheme, as thus amended, will greatly lessen the present congested state of the traffic passing from the park and Park Lane to Oxford Street and the Edgware Road, as it leaves the north side of the Arch practically free for the Oxford Street traffic; nevertheless all real lovers of the Metropolis will regret this mutilation of Mr. Speaight's symmetrical and attractive conception of what is really required. Indeed it seems to us that another opportunity of adding to the architectural beauty of London without involving any sacrifice of utilitarianism has been lost. Consequently, we feel justified in asking why proposals of an artistic nature, whose general utility is unquestioned, so often meet with discouragement and opposition from the public bodies we are accustomed to associate with the control and regulation of the streets and traffic of large cities.

The President's "At Home" at the R.I.B.A.

Those who were able to be present at the recent "At Home" given by the President of the Royal Institute of British Architects at 9, Conduit Street, W., enjoyed not only what was in itself a very pleasant social function, but were able to inspect, admire, or criticise the successful drawings and designs submitted in competition for the R.I.B.A. studentships and prizes. Another exhibit of great interest, and one which was much appreciated by many of the company present, was a very fine example of the work of Grinling Gibbons, consisting of the carved oak coat-of-arms of Winchester College, kindly lent to the Institute by Mr. George Hubbard, F.S.A. It now adorns the walls of the library. The general topic of conversation appeared to centre round uninspired prognostications as to the result of the competition for the London County Hall, but the majority of the guesses as to the successful architect were wrong, as it turns out.

The Lighting of Westminster Abbey.

The recent occasion of the funeral of Lord Kelvin in Westminster Abbey has prompted a writer in the "Electrical Review" to make some drastic comments on the present manner of lighting the building; and to offer an alternative scheme. He says: "It can only be looked upon as disgraceful neglect on the part of the responsible authorities that the transepts of such an important place of public worship, attracting at all times one of the largest congregations in London, should be lighted by nine gas standards, fitted with five to nine burners each, of such quality as appear to yield about 3 to 4 c.p., when working normally. Improved standards would not, however, be sufficient to do what is necessary to bring the lighting of the Abbey up to such a 'standard of illumination' as reasonable people, whether attending the Abbey to worship or to inspect its magnificent historical monuments, have a right to ask. In the present century, eyes have become

accustomed to more liberal lighting, and cannot with comfort discern the printed matter on a leaflet or hymn book, or the inscription on a tomb, under the wickedly bad light which is at present arranged. . . The total number of burners in the transepts is 69, and I suggests that each represents 4 c.p. Thus there is an effective illumination of 276 c.p. in an area measuring about 190ft. by 30ft., or, say, 5,700 sq. ft. In a clean new building with some reflecting surfaces as boundaries, ½ c.p. per sq. ft. produces a result that will usually pass without severe criticism; one-half of that amount, or ¼ c.p. per sq. ft., usually leaves many badly-lighted spots, about which somebody complains, but in the Abbey, where the surfaces roundabout do not lend themselves to reflection, the figure is less than one-twentieth of a candle-power per sq. ft., and consequently the result is contemptible. . . The effective candle-power should be brought up to something like 3,000 to 4,000, having regard to the surfaces of the walls and pillars, say, by 20 electroliers—ten on either side—each fitted with six Osram or tantalum lamps of about 30 c.p. A good effect would probably be obtained with arc lamps high up in the roof if any means of retrimming them is possible, or some inverted arc lamps with over-reflectors, the lights being completely hidden, would possibly produce a good floor illumination and a pleasing light by which the decorations of the building could be viewed. . . "

MECHANICAL VENTILATION.

Mr. Samuel Smith delivered a lecture on "The Movement of Air in Buildings" before last week's meeting of the architectural section of the Royal Philosophical Society of Glasgow. He first stated that movement of air was caused by four methods—diffusion, aspiration, heat, and mechanical power. After describing and showing by experiments how the movement was effected by diffusion and aspiration, the movement caused by heat was gone into in full detail, the various formulæ being discussed, and need of correction pointed out. To show the inefficiency of heat to cause the movement of air, the lecturer said that a fan at an expenditure of 58 heat units would do the same work in ten minutes as would be done by heat in 30 minutes by an expenditure of over 12,000 heat units. This pointed to the necessity for the introduction of mechanical ventilation, and no room or building where a body of people was gathered together, or which was too large to be heated by the radient heat from a fire, should be left dependent on any of the so-called natural systems of ventilation for the movement of the air it contained. Various systems of mechanical ventilation were described in detail, attention being directed to the point that the quantity of air moved did not determine whether the ventilation was perfect or not. The construction of the supply and exhaust ducts was dealt with, diagrams being shown which illustrated how a system of mechanical ventilation could be applied to a hall such as the City Hall, Glasgow, any system of natural ventilation being utterly inadequate to keep the air in a building of that size at a state of purity.

CLASSROOMS IN SECONDARY SCHOOLS.

In the building regulations for secondary schools and pupil-teacher centres* issued recently by the Board of Education (as already notified in our columns), the following rules as to classrooms are given:—

In every school there must be classrooms at the rate of 4 for every 100 scholars. There must be in the classrooms, as distinct from the laboratories and other rooms, sufficient accommodation for the whole number of scholars for whom the school is intended to provide. A lecture-room, however, if suitable for class teaching, may be counted as a classroom for not more than 30 scholars.

No classroom should be designed for more than 30 or fewer than 15 scholars.

Classrooms should be fitted with single desks, having a gangway of not less than 18ins. between the rows and between the desks and the wall on each side, 1ft. between the last row of desks and the back wall, and a clear space extending the full width of the room of not less than 7ft. 6ins. between the front row of desks and the wall for the teacher. The desks may be reckoned as occupying a space of about 3ft. by 2ft. in order to provide the requisite distance between the front of one and the back of that next in front of it. To provide for this a floor area of from 17 to 18 sq. ft. per head will be required, according to the size of the class. In cases where it is found difficult to provide this amount the Board will be prepared to accept a minimum allowance of 16 sq. ft. per head, provided that the arrangement can be shown to be satisfactory. In this case the desks should be placed closer together in pairs, with a gangway of not less than 2ft. between the double rows of desks.

Where fireplaces are provided, they should be placed in the outer corner of the room, in order to avoid interference with the master's platform and blackboard.

Stepped seating should not be used.

The walls of every room used for teaching, if ceiled at the level of the wall-plate, must be at least 12ft. high from the level of the floor to the ceiling: if ceiled to the rafters and collar beam, at least 11ft. high from the floor to the wall-plate, and at least 14ft. to the ceiling across the collar beam.

The central or assembly hall should not be used as a classroom, except for drawing. If it is found necessary to use the hall as a classroom, it must never be used for more than one class at once. A central hall occasionally used as a classroom will not be counted in the accommodation for which the school is recognised.

It should have a floor-space of at least 6 sq. ft. for each scholar for whom the school is to provide accommodation, and it is preferable that if the school be for fewer than 150 scholars a floor-space of 8 sq. ft. per scholar should be provided.

Where no hall is provided there must be a large well-lighted corridor giving access to the various rooms, this must be not less than 8ft. wide in the case of small schools, the width being increased with the size of the school. In these cases it is advisable that two adjacent classrooms should be so arranged that they can be thrown together to form a large room when required.

*To be obtained from Messrs. Wyman and Sons, Ltd., 109, Fetter Lane, E.C., price 2d. (post free 2½d.)

The area of window-glass should approximate to one-fifth the area of the floor-space in rooms used for teaching, and in other rooms to not less than one-eighth.

Lighting.

The light in classrooms must be admitted from the left side of the scholars. (This rule will be found greatly to influence the planning.) All other windows in classrooms should be regarded as supplementary or for ventilation. Where left light is impossible, right light is next best. Windows full in the eyes of scholars cannot be approved. Unless the top of the windows be more than 12ft. above the floor, the plan should show no space more than 20ft. from the window-wall in any room used for teaching.

Windows should never be provided for the sake merely of external effect. All kinds of glazing which diminish the light and are troublesome to keep clean and in repair must be avoided. A large portion of each window should be made to open for ventilation and for cleaning.

The sills of the main lighting windows should be placed not more than 4ft. above the floor; the tops of the windows should, as a rule, reach nearly to the ceiling; the upper portion should be made to swing. The ordinary rules respecting hospitals should here be remembered. Large spaces between the window heads and ceiling are productive of foul rooms.

Skylights are objectionable. They cannot be approved in schoolrooms or classrooms. They will only be allowed in central halls having ridge or apex ventilation.

The colouring of the walls and ceilings, and of all fittings in the rooms should be carefully considered as affecting the light. This point and the size and position of the windows are especially important in their bearing on the eyesight of the children.

The windows should be properly distributed over the walls of the classrooms, so that every desk shall be sufficiently lighted. The glass line of the window furthest from the teacher should be on a line with the back of the last row of desks.

Orleans House, Liverpool, of which Mr. Huon Matear is the architect, has the lower storey constructed of "Standard Grey" Norwegian granite, fine axed. This has been supplied and executed by Messrs. A. and F. Manuelle, of 57, Gracechurch Street, London, E.C.

School Buildings: Watford Managers and their own Architect.—The Watford managers of the Hertfordshire County Council schools held a special meeting last week for the purpose of discussing the report of a conference as to school buildings and their cost by members of the County Education Committee. The discussion, so far as the Watford managers were concerned, turned largely on the recommendation that in future no architect shall be employed in the erection of any County Council school, but that the plans be prepared by the county surveyor, and the buildings be erected under his direction. After a great deal of argument, all of which turned on the question as to whether architects' fees should not be saved, the matter was put to the vote, when only five voted for the recommendation of the conference that the county surveyor should for the future be the architect, and seven against.

LONDON COUNTY HALL COMPETITION.

The result of the important competition for the new County Hall to be erected on a site adjoining Westminster Bridge, on the south side of the river, was communicated to the Press on Thursday evening last, and, as most of our readers will have learnt by this time, the successful architect is Mr. Ralph Knott, of Chelsea. We reproduce his design in this issue.

The twenty-three designs submitted are shown by 346 drawings, and the assessors congratulate the Council on having secured "a fine scheme," which commended their warm admiration for its "forcible and artistic suggestion and brilliant qualities."

The drawings are now in the Medical Hall on the Embankment (adjoining Waterloo Bridge), and will be on public exhibition for the week commencing on Friday next, February 7th, from 10 to 8.

We understand that the committee in charge of the matter experienced considerable difficulty in renting a suitable place for the display of the drawings: but one is surprised that, in the end, so inadequate an arrangement should have been decided on as is the case at the Medical Hall. The strainers are there crowded together in the lecture theatre and in another room some little distance away, and it is quite impossible to judge the drawings properly when hung in this manner.

It will be recollected that there was first a preliminary sketch-competition, and from the designs then submitted the assessors, Mr. Norman Shaw, R.A., and Mr. W. E. Riley, F.R.I.B.A. (superintending Architect to the London County Council), selected fifteen architects to compete in the final competition. These architects were:—

Mr. R. Frank Atkinson, F.R.I.B.A.
Mr. Hippolyte J. Blanc, F.R.I.B.A., A.R.S.A., F.S.A.
Mr. G. Washington Browne.
Mr. T. Davidson, A.R.I.B.A.
Mr. Matthew J. Dawson, A.R.I.B.A.
Mr. J. B. Fulton, A.R.I.B.A.
Messrs. Gardner and Hill.
Mr. W. Haywood.
Messrs. Houston and Horne (A.R.I.B.A.).
Messrs. Jemmett and McCombie.
Mr. Ralph Knott.
Messrs. A. Marshall Mackenzie (F.R.I.B.A., A.R.S.A.) and Son (A.R.I.B.A.).
Messrs. Russell and Cooper FF.R.I.B.A.
Messrs. Warwick and Hall, AA.R.I.B.A.
Messrs. Clyde Young and E. W. Poley, AA.R.I.B.A.

The Council also invited the following eight architects to submit designs in the final competition:—

Mr. John Belcher, A.R.A.
Mr. W. Flockhart, F.R.I.B.A.
Mr. Ernest George, F.R.I.B.A.
Mr. Henry T. Hare, F.R.I.B.A.
Mr. T. G. Jackson, R.A.
Mr. E. L. Lutyens, F.R.I.B.A.
Mr. E. W. Mountford, F.R.I.B.A.
Messrs. Nicholson and Corlette (Sir Charles Nicholson, Bart., M.A., F.R.I.B.A., and Mr. H. C. Corlette, F.R.I.B.A.).

The date for the sending in of the designs in the final competition was December 30th.

It was arranged that, in addition to Mr. Norman Shaw and Mr. W. E. Riley, there should be a third assessor for the final competition, to be selected by the competitors themselves, and Sir Aston Webb, R.A., was chosen to act in this capacity.

Each of the competitors in the final stage will receive an honorarium of 200 guineas, while Mr. Norman Shaw and Sir Aston Webb will each receive 1,000 guineas. The successful architect, Mr. Knott, will receive a commission at the rate of 4½ per cent. on the cost of the building (£850,000), while the remaining ½ per cent. will go to Mr. Riley for his part of the work. Mr. Knott will thus receive nearly £40,000, and Mr. Riley about £4,500.

It was in 1906 that the scheme for a County Hall passed a Select Committee of the House of Commons, being later embodied in an Act of Parliament. The total estimate of cost was as follows:—

Acquisition of land ...	£600,000
Erection of Building ...	1,056,000
Embankment along the river front ...	55,000
Total	£1,711,000

The cost of the building was reduced, in a later scheme, to an amount not exceeding £850,000.

Against this figure must be set the sum of £400,000, the estimated value of the buildings at Spring Gardens, which, of course, the County Council will vacate when its new home is ready. About £20,000 a year will also be saved in rentals of premises elsewhere, which the Council now occupies because its central offices are not large enough for all its staff.

The successful architect, Mr. Ralph Knott, is quite a young man, being only

MR. RALPH KNOTT.
The Successful Architect in the London County Hall Competition.

twenty-nine years of age. He was educated at the City of London School, and at the age of 17 entered the office of Messrs. Woodd and Ainslie, architects, of Westminster, as articled pupil. After being a little over three years with this firm, he entered the office of Sir Aston Webb, where he is at present. Like the generality of other young architects, he has given attention to open competitions, and though, with the exception of the County Hall, he has not before gained a first place, he was placed second in the competition for the Bristol Central Library, and second also in the competition for the new library at Malvern.

Criticism of the Designs.

It is naturally only by a comparison of the selected design with others that one is in a position to say if it is worthy of its place, whatever its intrinsic merits may be.

In this case it is impossible in the time at our disposal to give anything like a résumé of the designs submitted, but it may be said without fear of contradiction that the invited architects, as a whole, have not justified the choice made, and that without the outsiders the competition would have proved a poor and disappointing one.

Mr. Hare alone of the invited competitors sends in a design which is among the best of those submitted. Included in this category also must be counted the design by Messrs. Russell and Cooper and the very fine scheme of Messrs. Jemmett and McCombie; indeed at present we should be disposed to put these two designs down as those deserving, with the winner, the best place in the competition. Mr. Frank Atkinson also submits a fine scheme—somewhat too grandiose perhaps in its entrances and staircases, but on the whole dignified, and well and simply laid out.

After a cursory inspection of the other designs, what immediately strikes one about Mr. Knott's plan is what we may term the singleness and perfection of the root idea. There is no evidence of difficulties which have required special ingenuity to master. Had this been the only design submitted, one would have thought the problem an easy one to solve. It is only by inspection of the work of other competitors that we are able to appreciate the genius (for there is no other word which so nearly describes it) displayed in the setting out of the scheme. In the way in which it excels other schemes, it is like Messrs. Lanchester and Rickards' design for the Cardiff City Hall. The only other plan which appears to be in the same category is that of Messrs. Jemmett and McCombie, and this is perhaps marred by the fact that the short frontage to Westminster Bridge Road is treated as the most important one, though the feature made of an open court accessible from the Belvedere Road for carriages minimises the defects of such a scheme—defects which are apparent in some of the other designs submitted.

In the selected design the Belvedere Road frontage is boldly accepted as the principal one, the building line being kept parallel with the river front.

In the centre of the front is placed the hall, which is circular in plan, and around it is the carriage-way leading to the principal entrance. By this arrangement it matters little whether the hall is ultimately omitted or not; it is a harmonious and constituent part of the design without being essential to it.

Two staircases right and left of the entrance lead up to the principal floor, the central feature of which is the circular council chamber with a corridor running around it, and division lobbies to either side. Members' rooms facing right and left on to large quadrangles flank this centre block, the space fronting on the river being occupied by the reading room and library, two L-shaped rooms projecting 60 feet towards the river and connected by a columned terrace set four or five feet behind their outermost projection. This is, we think, one of the weakest points of the design. The enormous projections inevitably cut the design into three sharply contracting portions, doing away with the dignity and breadth of the long river front which, it would seem, should have been an essential feature of the design. However, these are points which can be amended in execution.

The spaces to right and left of the centre block contain a transverse wing with a centre corridor flanked to a double row of rooms and two large quadrangles on either side of it. The corridors are not, apparently, lighted in any way; we suppose they would be lighted by continuous fanlights along the upper parts of walls, as in the Bath Municipal Buildings.

Opposite each end of the transverse blocks are entrances from the Belvedere Road and Embankment, and staircases op-

posite to them, lavatory blocks being placed off each longitudinal corridor in each area.

The arrangement of the basement is exceedingly ingenious and simple; a sloping way is arranged at the north end of the buildings down which carts can be taken through each quadrangle, the transverse blocks being cut through to make room for the cartway; thus stores can be introduced from carts at almost any point.

The arrangement and treatment of the circular hall is exceedingly ingenious and carefully thought out, as well as pleasinglv designed in section.

When, however, we come to examine the elevations, we confess to a feeling of disappointment. We are pleased to see that a design has been accepted that does not rely on meritricious detail or over-elaboration for its effect, but we think at the same time that so large a building demands a more stately and ordered treatment than is here apparent.

Excepting the columned terrace and pavilions at each angle, also treated with engaged columns, there are practically no "features" in the design, and when it is added that the space between the columns in the pavilions above-mentioned is broken up with no fewer than five storeys of windows, it will be felt that either the columns or windows are out of scale. Had the fronts been treated throughout their length with engaged columns or pilasters, this sensation might disappear. As it is, the fenestration of the fronts, where the whole height is broken up into six distinct storeys, is in rather uneasy contrast with the pavilions.

We feel that the fronts would gain much if the windows of some of the storeys were architecturally grouped together, thus dividing the whole height into fewer distinct divisions.

Taken as a whole, however, the scheme is one of very great promise, and such defects as are apparent can readily be got rid of in execution.

The most beautifully laid out plan is that of Messrs. Jemmett and McCombie, which clearly shows the trace of French training and influence. The buildings follow the Belvedere Road and river front, the axial line being laid down from the centre of the Westminster Bridge Road front. A loggia from the latter leads to a square courtyard, entered from Belvedere Road by a carriage-way, and from the river front by a corresponding approach and flight of steps.

Over the front to Westminster Bridge Road, and approached from either side of the grand loggia and vestibule, is the hall, with crush rooms and vestibules. On the further side of the courtyard is the council chamber, and disposed along the sides of the courtyard and the river front are rooms for the use of members. The remaining transverse blocks are coupled on each side of a staircase next the broad public corridor, which forms the axis of the whole design. The rooms in the transverse blocks look into wide open courts, and the corridors into narrower areas, which also light the lavatory blocks.

The accommodation is so planned as to obviate the necessity for long and involved corridors.

The treatment of the elevations is, however, unequal to the plans, and though refined and careful is somewhat commonplace and uninteresting in effect.

The only lofty feature, a dome placed on the axial line over the main staircase, would not compose well when seen from the river.

For want of time and space, we are unable in this issue to go into any of the other designs in detail, but next week we shall do so, when we hope also to give further illustrations.

Notes on Competitions.

Secondary School, Sowerby Bridge.

Messrs. Longbottom and Culpan, of Halifax, have been placed first in this competition; and Mr. R. Fielding Farrar, of Leeds, second. The designs were on exhibition on Thursday, Friday, and Saturday last. Mr. J. Vicars Edwards, of Wakefield, was the assessor.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
Feb. 12	ELEMENTARY SCHOOL AT BACUP. Premiums £20, £10, and £5. Names and addresses of architects desirous of competing, with list of works executed, "and the terms for undertaking the school if engaged for that purpose," to be forwarded bv this date to the Secretary of the Education Committee, Rochdale Road, Bacup.
Feb. 15	MUNICIPAL BUILDINGS AT SHANGHAI. — Conditions, together with site plan, may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.
Feb. 17	NEW COUNCIL OFFICES, &c., AT RADCLIFFE.—Limited to architects in Lancashire. Assessor, Mr. G. H. Willoughby, F.R.I.B.A. Premiums £75, £50, and £25. Conditions from S. Mills, clerk, Council Offices, Radcliffe, Manchester.
Mar. 7	SECONDARY SCHOOL AT LOWESTOFT—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft. Deposit, 5s.
April 28	ADMINISTRATION OFFICES AT PONTYPRIDD, for the Guardians.—Conditions from William Spickett. Clerk, Union Offices, Pontypridd, on or before January 31. Deposit £2 2s.
May 31	EMERGENCY HOSPITAL AT ILFORD. —Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.

Notes and News.

A 200-TON CRANE will be an important part of the equipment of the Keyham Extension, Plymouth. It is about to be erected.

* * *

A MEMORIAL TABLET has been affixed to No. 106, Great Russell Street, where Augustus Charles Pugin and Augustus Welby Pugin lived.

* * *

SOUTHWARK'S NEW LIBRARY, at the corner of the Old and New Kent Roads, was formally opened last week. It has cost £7,000, and is on the "open access" system.

* * *

ROYAL ACADEMY EXHIBITION.—The sending-in day for architectural works and watercolours for this year's Academy is Friday, March 27th. Oil-paintings are to be submitted on March 28th and 30th, and sculpture on March 31st.

* * *

THE A.A. PLAY.—"Metopemania : or a Sparing Use of Art"—will be produced at the Gaiety Restaurant on February 26th, 27th and 28th. It has been "concocted by the editorial staff of the 'Purple Patch' and musicked by Mr. Claude Kelly."

A NEW HYDRO AT SKEGNESS is nearing completion. It is situated between the Clock Tower and the Seacroft Golf Links. The architect is Mr. R. C. Sutton, of Nottingham. The builders are Messrs. Thompson, of Nottingham and Louth.

* * *

THE COURTYARD OF THE HOTEL GREAT CENTRAL, on Marylebone Road, is to be covered so as to form a winter garden. The present roadway leading to the hotel will be diverted by forming a sweep from Great Central Street into Harewood Avenue.

* * *

A NEW POST OFFICE FOR BIRKENHEAD has been erected at the corner of Argyle Street and Oliver Street, from designs prepared in H.M. Office of Works. It is expected to be ready for occupation by the end of March. Mr. J. E. Gabbuti is the contractor.

* * *

THE LOCAL GOVERNMENT ANNUAL FOR 1908 is to hand. It follows on the same lines as former editions, giving lists of the officials of the London County Council, the City Corporation, Metropolitan Borough Councils, Municipal Corporations, and Urban and Rural District Councils. It is an invaluable book of reference, published from the "Local Government Journal" Office, 27a, Farringdon Street, price 1s. 6d.

* * *

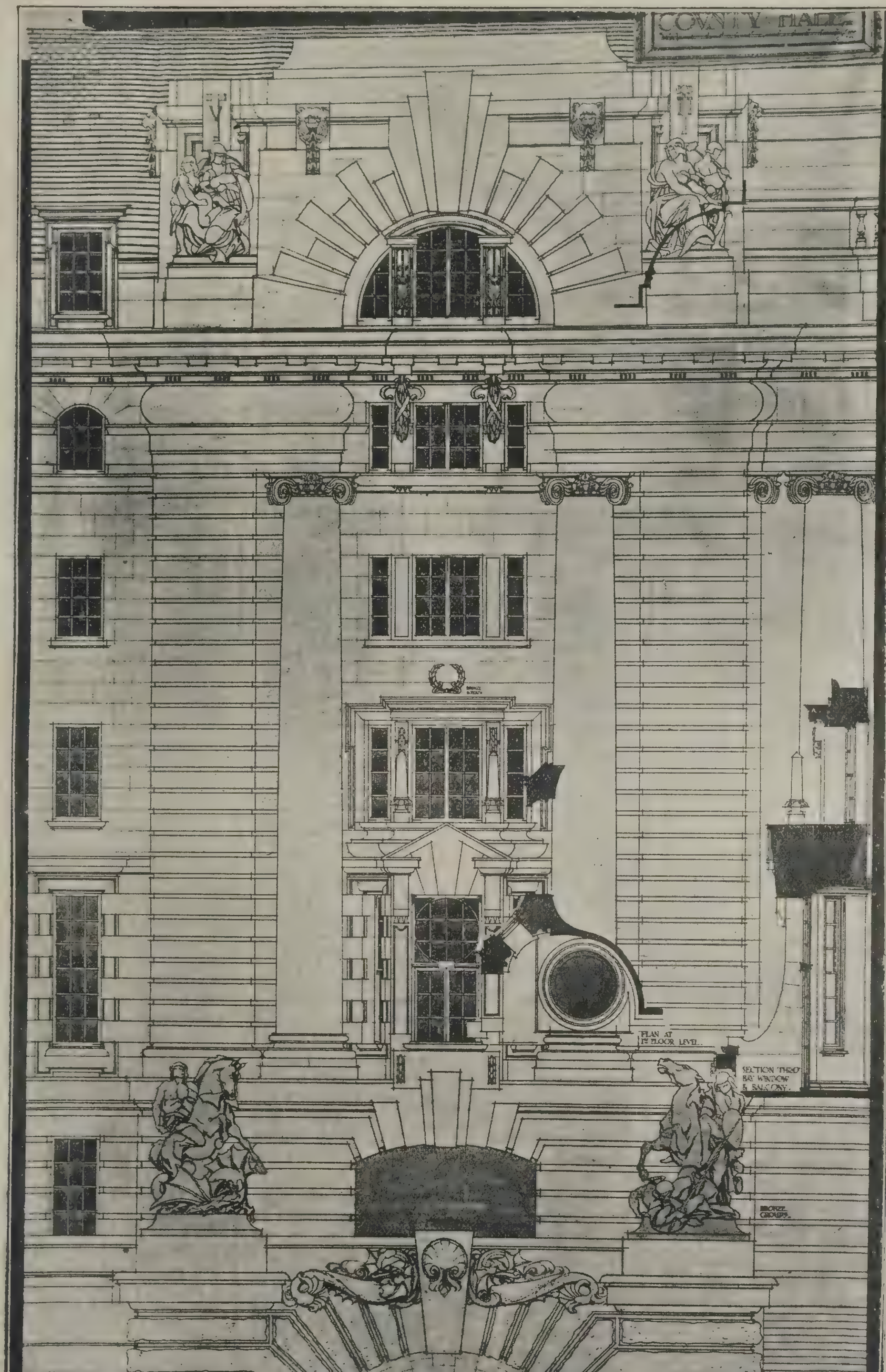
A NEW LONDON THEATRE.—At the corner of the Haymarket and Orange Street a new theatre is to be erected by Mr. I. N. Lyons. Messrs. Ernest Runtz and Ford are the architects. The building is to have a frontage to the Haymarket of 80ft., and a depth of 110ft. Carrara marble will be used to a very large extent for the facade. An order has also been placed with Messrs. Elkington for a number of bronze figures, designed by a pupil of Mr. George Frampton, R.A. The new theatre will have two tiers.

* * *

THE BUILDING TRADE IN BRISTOL. — At the annual general meeting of the Bristol Master Builders' Association held last week, the annual report was read. This stated that the past year, like others preceding it, had been a very bad year for the building trade in Bristol. Very few contracts had been given out, and, as a consequence, many builders had experienced difficulty in finding work to keep their men employed. The outlook was not encouraging, but it was hoped that brighter times were in store. Mr. F. N. Cowlin was elected president for the ensuing year.

* * *

CUMBERLAND COUNTY ARCHITECT. — A Special Committee of the Cumberland County Council have been considering the terms of the appointment of the county architect, and they now recommend that, in addition to the architect being employed at £500 a year, a surveyor of buildings be also employed at £225 a year. The duties of the architect are to include the preparation of plans, specifications, and quantities, and the supervision of the erection of all new buildings. In the case of buildings costing over £5,000, the Committee recommend the payment of a commission of 2½ per cent. on the expenditure above £5,000. The surveyor will attend to the buildings belonging to the county and will carry out necessary repairs. The recommendations will come before the County Council at their quarterly meeting this week.



LONDON COUNTY HALL: DETAIL OF SELECTED DESIGN, RALPH KNOTT, ARCHITECT.

Law Cases.

CONDITIONS OF HIRE: AN INTERESTING CASE.—An action brought by Messrs. Harry Hems and Sons, ecclesiastical art workers, of Exeter, against Mr. J. H. Heathman, of Messrs. J. Heathman and Co., ladder makers, of Fulham, came before his Honour Judge Howland Roberts at the St. Albans County Court recently. The action arose out of certain works of renovation executed by Messrs. Hems and Sons to the high altar screen at St. Albans Cathedral, a special ladder tower having been hired for the purpose by the plaintiffs from the defendant. The claim was for 19s., the balance of a deposit.—Charles Pengelly, in the employment of the plaintiffs, said a deposit of £3 was paid. and the ladder was used from the Monday until the following Saturday. It had arrived, however, in a very much damaged condition, and a man had to be sent for to repair the ladder before it could be used.—The defendant, who conducted his own case, submitted that he acted simply as the agent of the plaintiffs in despatching the ladder tower, which was entirely at the plaintiffs' risk. If any damage was done by the railway company in transit, it remained for the plaintiffs to sue the railway company and obtain redress from them. He simply knew that the tower was despatched by him in thorough working condition.—His Honour said the case seemed to be not one of a hirer having negligently handled the goods hired, but as to the person to be held responsible for the damage done. At whose risk was the ladder tower sent when it left Messrs. Heathman's premises? It seemed to him that the terms on which the ladder tower had been hired placed it beyond any question that the apparatus was at the risk of Messrs. Harry Hems and Sons. The payment of carriage on the ladder tower was a payment made by Messrs. Heathman solely on behalf of Messrs. Hems and Sons, and debited to them. In the circumstances they were only agents for the purpose of getting the contract carried out, and it rested with Messrs. Hems to take proceedings against the railway company as the persons on whose behalf the carriage was undertaken. His Honour therefore gave judgment for the defendant upon the claim and upon a counter-claim, with costs.

A CLAIM IN RESPECT TO CARVING WORK.—At the Manchester County Court on January 27th His Honour Judge Parry heard the action brought by Messrs. Robert Neill and Sons, builders, of Strangeways, to recover £12 1s. 2d. for work done and materials supplied to Messrs. H. H. Martyn and Co., Ltd., architectural sculptors, of Cheltenham. Mr. Jordan, for the plaintiffs, said the work was in connection with the building of new municipal schools at South Shields. Messrs. Neill had secured the contract for £47,900, and among other sub-contracts was the one for ornamental stone-carving secured by the defendants. The question at issue was whether certain work done by Messrs. Neill for Messrs. Martyn was or was not included in the original contract. The plaintiffs contended that it had been done at the defendants' own request, and ought to be paid for separately by them. It consisted of sharpening tools, the use of a steam crane, making "bankers," and erecting sheds for the carvers to work under. Mr. Wethered, for the defendants, pointed out that in the tender the work charged for was expressly said to be builders' work. His clients were stone carvers, not builders. Messrs. Neill had sent to the South Shields Corporation the same bill that they were now suing the defendants for.—Mr. James Webb, manager for Messrs. Neill, was the only witness called. He asserted that the work claimed for was never included in original contracts unless it was specified in them. All that the builders were expected to do was to leave the stone on the ground. It could have been carved in the open air.—Judge Parry: "In your contract you agreed to give facilities to all other trades. It seems to me all these items claimed for are facilities." Witness: "We are not expected to erect sheds and raise the stone on to bankers." His Honour: "The contract says you are to leave the stone in position ready for the carver. If you want your dinner ready it means that it is to be put on the table for you. You don't want it left down in the kitchen. There will be judgment for the defendants, with costs."

THE GARDEN CLUB OF THE FRANCO-BRITISH EXHIBITION has a frontage of 300 ft. and a depth of more then 130ft. The façade of the great dining hall consists entirely of large glazed panels, and its doors and windows open directly upon gardens, in the centre of which is an ornamental sunken bandstand. There is a banqueting hall nearly 100ft. long, and a somewhat smaller room in which private dinner parties may be given by members, while on the lower floor and on the terrace above are numerous partly-closed spaces for smaller dinners and luncheons, in addition to a score of private dining-rooms.

* * *

CHURCH STRUCK BY LIGHTNING: REMARKABLE EFFECT.—The ancient parish church of Parracombe, a little village ten miles from Ilfracombe, was struck by lightning on Wednesday last. A portion of the tower was torn away, and the stone bench in the porch was smashed to pieces. The pulpit was splintered like matchwood, the screen was cracked, and the walls were twisted out of shape. All the glass in the windows was smashed, and the stone pillars dislocated. The churchyard is littered with stones, and the inside of the edifice presents a scene of complete devastation. One large stone, weighing at least ¾cwt., was hurled more than a hundred yards from the church, while the fields adjoining were strewn with fallen masonry.

* * *

"WHOLE TIME": FULHAM COUNCIL AND ITS SANITARY INSPECTOR.—The question as to whether a sanitary inspector in the employ of the Fulham Borough Council can also act as secretary of a local building society is occupying the attention of the council. The officer in question has held both positions for a number of years, and the matter has come up from time to time. Matters were brought to a head recently by a protesting ratepayer presenting a petition to the Local Government Board expressing dissatisfaction at the way the council had dealt with the case. At last week's meeting of the Council Alderman Paul Bennetts asked if any communication had been received from the Local Government Board, and was told that there had been, and that it would be dealt with by the Law and Parliamentary Committee in the usual course, and, further, that it would come up at the next meeting of the Public Health Committee.

Correspondence.

Vanishing London.

To the Editor of THE BUILDERS' JOURNAL.

SIR.—The wide interest which has been displayed in the fate of Crosby Hall makes the present a fitting occasion to bring once more before the London public the crying need for a full and comprehensive record of the historic buildings which still exist within and around our great city. The undersigned members and supporters of the Committee for the Survey of the Memorials of Greater London, therefore, on behalf of the general body of the Committee's members and well-wishers, desire to make an earnest appeal for assistance in their work.

The Committee's work is well known. During 13 years there has been collected a large mass of material, mainly by the voluntary work of members, and from this have been prepared seven valuable monographs on such buildings as The Trinity Hospital, Mile End; the Churches of Stratford-le-Bow and Stepney; Bromley Palace; the Great House, Leyton, etc., besides the surveys of the complete parishes of Bromley-by-Bow and Chelsea, the latter of which is in active preparation.

The historical value of these monographs cannot be over-estimated, since they not only present a carefully verified account of the persons and incidents connected with the past existence of each building, but give also a complete architectural record of the fabric itself by means of elaborate drawings and photographs. During the whole period of the movement in favour of the preservation of Crosby Hall the Committee have been pursuing this most important work in regard to this building, and the public may expect this month to be in possession of the result of their labours in the form of their ninth monograph.

The voluntary work of the "active" section has enabled the Committee to publish these volumes in an expensive and tasteful form, befitting their character as permanent records, and yet to offer them to the public at a comparatively low price. It is clear however that these gratuitous services must be seconded by the practical support of a larger roll of subscribing members than has hitherto been available. The Committee therefore confidently appeal to the public to join their ranks and to participate in the preparation of a work which shall be worthy of London.

The Committee, in issuing now the complete monograph on Crosby Hall, which is illustrated by reproductions of old prints and a splendid series of modern drawings of the Hall, only just completed, wish to call attention to the fact that copies of any publications issued by them are presented first to all their members.

Persons wishing either to subscribe to this particular monograph or to become regular supporters of the Committee are requested to communicate with the secretary, Mr. Percy Lovell, Parliament Chambers, Great Smith Street, S.W.

We are, yours obediently,

RIPON.	W. D. CAROE.
MARY C. LOVELACE.	WALTER CRANE.
MONKSWELL.	W. J. HARDY.
CURZON.	PHILIP NORMAN.
BALCARRES.	

Bournemouth Municipal Buildings.

We have received some correspondence on this subject, but are obliged to hold it over till next week, owing to the pressure on our space.

R.I.B.A.

A meeting of the Royal Institute of British Architects was held on Monday evening last at 9, Conduit Street, W., the chair being occupied by the president, Mr. T. E. Collcutt.

The deaths of Mr. J. B. Colson, architect and surveyor to the Dean and Chapter of Winchester Cathedral; and of Mr. E. L. Galiria, of Malta, were recorded.

New Secretary.

It was stated that Mr. MacAlister had been appointed secretary of the Institute, in succession to Mr. Locke.

Royal Gold Medallist.

It was announced that the Council proposed to submit the name of M. Honoré Daumet, of Paris, as the fit recipient of the Royal Gold Medal for 1908.

Prof. Lethaby on the Theory of Greek Architecture.

Professor W. R. Lethaby, F.R.I.B.A., delivered an address to students, his theme being the theory of Greek architecture. In the course of this paper Professor Lethaby suggested that students should combine and form a sort of Pre-Raphaelite brotherhood in architecture, going right back to Greece for their starting-point.

R.I.B.A. Prize Drawings: A Criticism by Mr. E. Guy Dawber.

Mr. E. Guy Dawber, F.R.I.B.A., read a criticism of the works submitted for the 1907-8 prizes and studentships of the Institute, the prizes being afterwards distributed to the successful students.

Mr. Dawber said the Institute was to be heartily congratulated on the excellent display this year, for with perhaps one exception—the Soane—the work submitted was of a high order, the draughtsmanship especially being of better quality than of late years.

On looking at the designs as a whole, it seemed doubtful whether students had taken sufficient care to thoroughly grasp the problems set—whether they had understood the conditions and had realised that a building should be made to express its purpose in its design. In the competition for the Soane Medallion, for example, many competitors seemed to have entirely overlooked the primary object of the building. The subject, a custom house, at once suggested a building quiet almost to severity in its lines and grouping; yet almost without exception it had been treated in much too municipal a spirit, and grandiose erections more like town-halls and libraries had been designed.

Again, it was noticeable how much some students were influenced in their ideas by the passing fashion of the day: some noteworthy building was erected, and immediately any striking or unusual feature in it was borrowed and applied without regard to its suitability. Mr. Dawber said he felt that students should learn to study buildings and not to copy them, and that a more severe and scholarly type of design should be encouraged in these competitions, though with our present system of education this, perhaps, was somewhat difficult.

Mr. Drysdale's winning design for the Soane had a straightforward plan and exhibited a successful treatment of French Renaissance in the elevations; but, as a whole, it was rather too much broken up in its masses, and the tower seemed out of place. The draughtsmanship, however, was particularly beautiful, and Mr. Dawber had the same praise for these drawings as for those which had gained the Tite prize also for Mr. Drysdale, his design for "an open-air theatre" being brilliantly conceived and well worthy of the prize.

In regard to the Pugin studentship, Mr. Dawber urged that more attention should be given to the production of analytical studies and sketches rather than to pretty perspectives. The bold sketch with detail vaguely suggested was not of such ultimate value to the student as that which showed an attempt to get at the dry bones of the subject, as well as the pictorial exterior. And also that, as this prize was essentially for the study of mediæval architecture, the work submitted for it should be more or less Gothic in character. Much of the work sent in could not be classed under that head at all.

A vote of thanks to Professor Lethaby and to Mr. Guy Dawber was proposed by Mr. Reginald Blomfield, and seconded by Sir Aston Webb.

Our Plates.

Mr. Ralph Knott's successful design for the new London County Hall is dealt with in the criticism of the competition published elsewhere in this issue.

The design for railings and gates, with stone piers, by James Gibbs (1682-1754) is another of the series of designs by this great architect which we have been publishing during the present year. The design does not call for any special description, as it is self-explanatory. The ironwork is not in any way remarkable for freshness of detail, but the work as a whole shows that good sense of proportion and dignified treatment which is exhibited in all Gibbs's designs.

Views and Reviews.

The French Engineer's Handbook

The class of handbook which is known generally in English-speaking countries as a pocket-book, though very often it is not handy enough to be carried in the pocket, is excellent for the purposes of reference, and such works are used more than any other books on engineering subjects. The book which is used by French engineers, in the same way as "Molesworth" is used by English engineers, "Trautwine" by American engineers, and "Das Ingenieurs Handbuch" by German engineers, is Claudel's "Formules, tables et Renseignments Usuels." The 11th edition of this work has just been published, and has been entirely reconstructed, corrected, and in great part re-written under the direction of M. G. Daries, city engineer to Paris. Both M. Claudel and his successor (another able engineer) being deceased, M. Daries has well sustained the reputation of the work, the great value of which to the French engineer is established by the fact that 55,000 copies have been sold. The book is 8vo. size, and is in two volumes, totalling 2,450 pages, containing 1,230 illustrations. It is not of course a pocket-book, but its character is generally that of the works known as pocket-books, though it is better because the subjects treated are gone into a little more in detail. It stands indeed midway between the text-book and the book of formulae and tables, and, in our opinion, entirely supplants the latter. Text-books must, of course, be studied by the engineer, but those who have a grasp of the principles of engineering will find this an enclyclopædia from which can be extracted information entirely sufficient for the designer in most cases. The results of practice are recorded as well as a summary of the theory of almost every engineering subject. M. Daries has been assisted in his revision of the work by numerous specialist engineers who have contributed sections of the book. M. Daries has specialised to some extent on the subjects of hydraulics and water supply, and has himself contributed several important chapters that are most valuable. This revision, which was badly needed, has brought the work up-to-date. It has resulted in considerable extension and in some cases the addition of chapters, such as upon electricity, petrol motors, steam turbines, gas engines, automobiles, reinforced concrete, etc. Compared with the previous edition, the 11th edition contains 868 new illustrations, and 250 pages more, not to speak of the very extensive corrections and re-writing that has been carried out.

"Formules, Tables et Renseignements Usuels. Partie Pratique de l'Aide-memoire des Ingenieurs, architectes, entrepreneurs, agents voyers, dessinateurs, etc.," by J. Claudel, Ingenieur. 11th edition entirely reconstructed, revised and corrected under the direction of G. Daries, ingenieur de la Ville de Paris. 2 vols., price 30 francs. Paris: H. Dunod and E. Pinat, 49, Quai des Grands-Augustins.

A Memorial Tablet has been placed by the London County Council on 19, Curzon Street, Mayfair, where Lord Beaconsfield once resided.

* * *

A Monograph on Crosby Hall, illustrated by reproductions of old prints and a series of modern drawings, is being issued by the Committee for the Survey of the Memorials of Greater London.

* * *

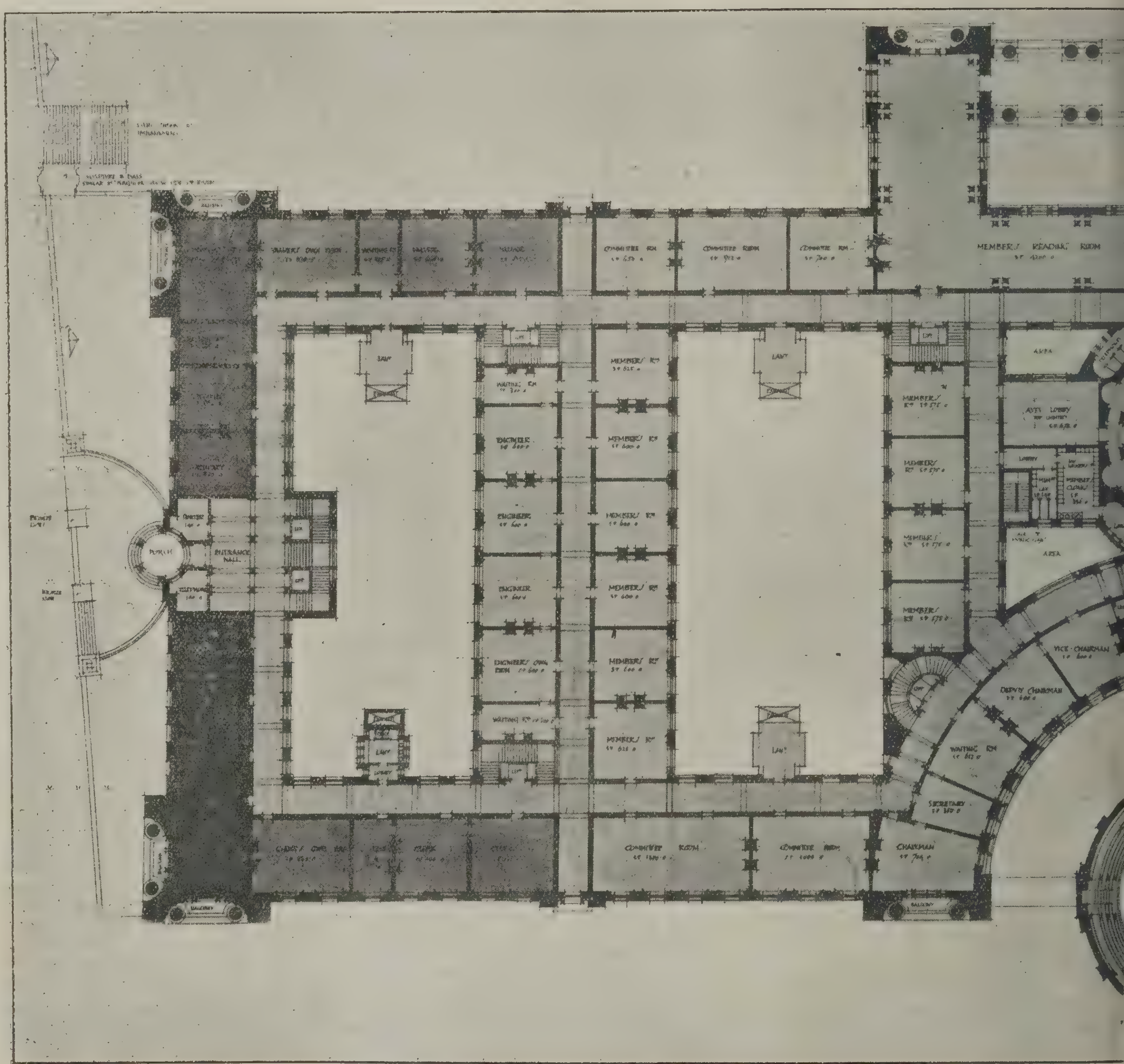
Widening of Hammersmith Broadway.—Towards the cost of widening Hammersmith Broadway on the northern side, the London County Council decided last week to contribute £30,000. One half of the Council's contribution will be charged to the tramways account, as the improvement has been partly necessitated by the Council's new tram lines from Putney to Harlesden.

* * *

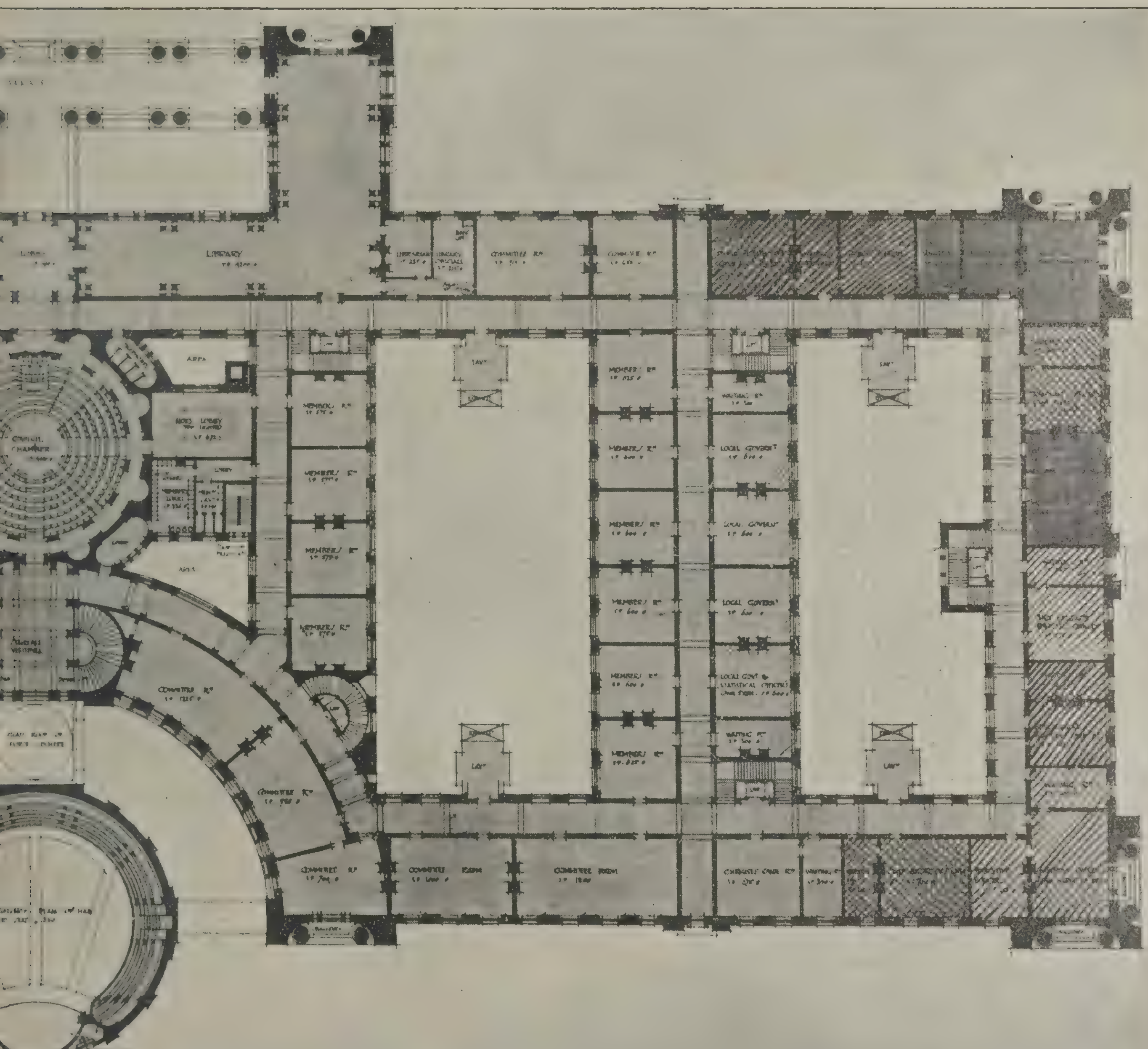
The Rip(o)lin Dream of Legislation.—A political cartoon under this heading appeared in the "Pall Mall Gazette" for January 30th. It is an adaptation of the well-known advertisement of "Ripolin," which shows three men behind one another—the one painting on a wall, and the other two painting on each other's backs.

* * *

The Singer Building. — With reference to the article on the Singer Building in New York which we published in our issue for January 29th, we may mention that the building was designed for the hollow-terra-cotta arch system of fireproofing, worked by the National Fireproofing Co., of 27, Chancery Lane, London, W.C., and that the work was carried out by their New York office. Messrs. George Wragge, Ltd., of Wardry Works and the Crafts, Salford, Manchester, and 209 and 211 Shaftesbury Avenue, London, W.C., executed over 3,000 casements for the Singer Building within 24 weeks from the date of order. These window frames were composed of 2in. steel sash bars with casements inserted of their No. 32 "In and Out" section, for safety cleaning, guaranteed water-tight. The frames were bolted direct into the steel constructional work.



LONDON COUNTY HALL: PLAN OF PRINCIPAL FLOOR (FIR



OOR) OF SELECTED DESIGN. RALPH KNOTT, ARCHITECT

CONTRACTORS' SECTION

(MONTHLY).

SCAFFOLDING CORDS AND ROPES.

At an inquest recently held by Dr. Danford Thomas at the Coroner's Court, Paddington Green, some interesting evidence was given as to the use of the ropes used in scaffolding. The inquest was on a man—a scaffolder—who met with his death while hauling on an ordinary rope fall used for lifting timbers, the fall being used in conjunction with a fixed pulley. The timber which was being lifted weighed about 2½cwts., and the circumference of the fall was 3ins. A fall of this size in perfect condition should carry as a safe load about 11cwts., and the fact that the breakage occurred with a little more than a quarter of this weight apparently showed a considerable weakness and deficiency in strength. In giving evidence, one of the witnesses stated that after six months' use ropes often lost one-quarter of their strength, and this statement elicited the fact that the rope in question had been in use about three years. The witness was pressed as to what might be considered the average life of a rope, and in refusing to give an opinion he was perhaps wise, as so much depends upon its treatment during use.

A few hints upon the care of ropes may perhaps be useful.

There are many kinds of ropes used in scaffolding, and they vary in quality from those extensively adulterated in the fibre by means of "batch" to the finest manilla. As a rule, scaffolding cords are tarred, but for falls it is better if untarred ropes are used, chiefly because of the extra flexibility gained. A fair price for a rope used for scaffolding cords is 34s. per cwt. This price should ensure that no adulteration has taken place. The tarring reduces the strength of a rope somewhat, but gives it a longer life, not to such an extent, however, if it is kept dry. This being so, it is apparent that when used in the erection of scaffolding tarred rope is the better, as it will be exposed to the continuous changes of weather. When out of use, ropes should be hung in a dry situation, i.e., under cover, with free access for air. They should be kept clean, and as free from lime and similar substances as possible. The manner in which ropes are often kept lying about on the ground, wet and muddy, must seriously affect their life and strength.

The usual scaffolding cord is known as a three-strand, and has no core. In buying, notice should be taken that the strands are evenly laid, close and smooth to the touch, and run at an angle of about 45 degrees. A greater angle than this throws an undue strain upon the fibres.

The ends of falls often show weakness first. This is generally due to the fact that when tied around material, especially if square in section, a greater stress is placed upon any parts which take an extra share of the weight. In such places it follows that there is an increased tendency for the fibres to break. A rope can be examined as to condition by forcibly untwisting the strands, and then by bending it backwards, as shown by the accompanying sketch. Any broken fibres will then show themselves.

ENGLISH v. AMERICAN METHODS OF HANDLING MATERIAL.

During the gale which raged over this country for most part of the week ended December 14th last, great consternation was caused in the neighbourhood of Piccadilly and St. James's Street, London, by the threatened collapse of a crane structure, which was being employed in the erection of the new premises for the Norwich Union Life Assurance Co., at the corner of these thoroughfares. For the handling of the materials used in the construction of the buildings, the modern English method had been adopted of mounting a heavy Scotch crane on the top of a three-legged derrick tower. Most people, and Londoners especially, have become familiar with these huge erections, and the average person might be excused for occasionally having doubts as to the safety of such structures, for, with their great height and comparatively small base area or span, the main impression they convey is that of instability.

The appalling result of the collapse of one of these structures in a closely built district may easily be imagined, and in the particular case mentioned above such a catastrophe was only averted by the prompt measures taken by the building staff and the police. The loss of life, and damage to property, resulting from the fall of say a 10-ton crane and its boiler from a height of over 100 ft. need not be dwelt upon.

Again, such a structure is very costly. We believe we are well within the mark in putting down the cost of the woodwork alone at £1 per foot of height, to which must be added the cost of erection, and the considerable time occupied in the latter work.

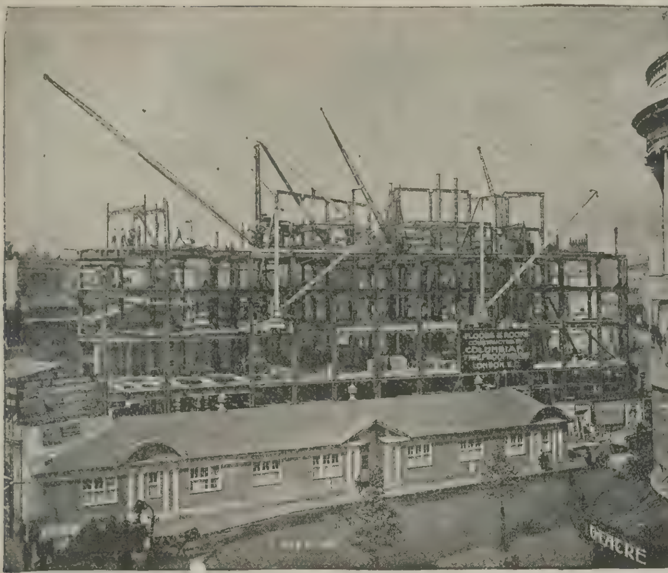
In the matter of the erection of high buildings our American friends have done so much that it may not be out of place here to briefly review some of their methods, and when it is remembered how quickly such great blocks as the Singer Building in New York are run up, it will be admitted that contractors here may have something to learn in this respect.

Practically all the high buildings in America, and most of those now being erected in this country, have a steel framework, and full advantage is taken of this fact. The usual method, at starting, is to mount one or two derricks on the ground level. These derricks are of the American type—that is to say, they are light cranes in which the engine, instead of being mounted on the mast of the crane, as in the Scotch type, consists of a horizontal hoisting engine, and is kept quite detached. Ropes are led from the drums of the engine under sheaves at the foot of the derrick mast, and thence to the point of the jib for derricking, and over it for hoisting. A swinging gear is also provided on the front of the engine, from which ropes are led round an angle-iron wheel of large diameter, fixed horizontally to the bottom of the mast; and in this manner the jib can be swung in any direction by simply moving a lever on the engine.

After the steel framework of the first or second storey (according to the length of the derrick jib) has been erected, the derrick timbers are hauled to the top of the framework and re-erected, when they are ready to proceed with the erection of the next storey or storeys. The engine remains on the ground all the time, the ropes being led as before to the derrick, the only difference being that the derrick is now one or two storeys above the engine which operates it. The same method is followed until the full height of the building is reached, and it will be seen that it is a comparatively simple matter to hoist the derrick timbers from floor to floor, the whole operation of dismounting, hoisting and remounting only occupying a few hours, and the engine being available for the purpose. When a certain height is reached, the engine-man is directed by a simple arrangement of a signal bell worked by a cord, each movement, such as "hoist" or "lower," being signalled by a different number of strokes on the bell.

For the handling of the stonework, practically the same method is followed. By this time the steel framework is probably complete, and the derrick is mounted on the face of the steelwork on one of the higher storeys, the engine being kept on the ground floor inside the building.

This method of construction was followed by the Waring-White Building Co., of London, in the erection of two great buildings in the Metropolis recently, namely, the Ritz Hotel in Piccadilly, and the "Morning Post" building at the corner of Aldwych and the Strand. We reproduce on the next page a photograph of the latter building in course of construction. This shows the derricks mounted on the face of the building for laying the stonework. A number of these derricks were employed at the same time. The derrick engines used on these buildings were supplied by the Lidgerwood Manufactur-



THE "MORNING POST" BUILDING, LONDON, IN COURSE OF CONSTRUCTION, SHOWING AMERICAN DERRICKS IN POSITION.

ing Co., of Caxton House, Westminster, which firm, we understand, makes a speciality of engines for this purpose. Their main features are the high speeds at which they run, and the fact that, being of the friction-drum type, no steam is used when lowering the load, this being done simply by the overhauling of the drum, which is controlled by powerful brakes as well as by the friction itself.

For the raising of such materials as bricks for partition walls, concrete for fireproof floors, etc., a light platform elevator is rigged up. This is a very inexpensive structure consisting of a few light timbers to act as guides for the platform or cage; which cage is suitable for taking wheelbarrows or hods or any kind of load that may be required. The Lidgerwood Manufacturing Co. build a special friction-drum engine for this duty, and as any speed up to 500ft. per minute can be attained, it is surprising what a large quantity of material an arrangement of this kind can hoist to the top floor of a building in a few hours. The elevator is, of course, arranged so that the cage can be stopped opposite any floor, and one engine can thus keep different gangs of men on the various floors supplied with material.

Considering the simple nature of the plant and methods just described, the small cost involved, and, above all, the entire freedom of any danger from such a catastrophe as was recently threatened in Piccadilly, it is matter for surprise that these methods have not been more frequently adopted by English builders.

BUILDING FOUNDATIONS.

By W. I. Parry.

The importance of the correct founding of a building is so self-evident that it seems almost superfluous to dwell upon it. Yet it is rather questionable whether until the last twenty or thirty years any definite and well-defined distribution of the loads was attempted on any closely calculated basis. The general practice was to be sure to make the foundation so heavy and strong that it would meet all possible conditions, whether they were likely to occur or not. In other words, the worst imaginable condition and the best were treated closely alike with a view to overcoming any possible heavy loads, even if this end were accomplished at the expense of excessive strength at some unneeded points.

Perhaps no one agency has contributed more toward the development of careful calculation of foundations than the evolution of the high office building in America, particularly that of the cage or skeleton type. The very distribution of all the loads carried by the building to individual points by the columns, instead of the more diffused method of walls and piers, created the necessity of approximately accurate calculation of the loads to be carried in order to properly design appropriate columns; and, in the nature of things, this ensured the knowledge of the load to be taken care of by each of the footings; which, in turn, made it possible for the foundation to be determined with accuracy.

To design a foundation, the first and most important thing is, of course, to ascertain the character of the soil on which we are to build, and, with it, the appropriate load it should carry safely. After this is determined, with some degree of accuracy, the total load per square foot should be found out; and the relation of this load to the soil conditions should regulate the design.

It is essential to separate the known dead loads from the assumed live loads and so to design the footings that there will be no unequal settlement. To illustrate the unequal distribution of these two kinds of loads, the accompanying table shows the loads on the various columns of a building recently designed—an American example, as illustrating modern practice in the States. The difference will be noticed in the ratio of Column No. 7, a wall column, and Column No. 5, an interior column. If these two footings were designed on the same basis, that of their total loads only, and if the unit of pressure closely approached the safe limit of the underlying soil, it will be readily appreciated how the tendency of the wall column to settle more rapidly than the interior column would be created. In order to overcome this tendency, let only the dead load be considered, working back from the total load, based upon the selected unit, and taking the worst case of disproportion of these two kinds of loads as a basis. From the table it will be seen that Column No. 5, an interior column—where the total load is 330 tons, the live load 136 tons, and the dead load 194 tons—presents the worst ratio. For example, 330 tons, the total load, divided by four tons, our assumed unit of pressure, equals 83 sq. ft. The dead load, 194 tons, divided by this area equals 2.34 tons per sq. ft. And applying this new constant, 2.34 tons, to the dead loads of all the column footings, we reach the various areas to be determined; which produces a uniform loading based upon the several dead loads, the footings in all cases consequently never exceeding the constant which we have taken for the maximum total loads, both dead and live. This should produce the result of an equal settlement.

The method described does not, of course, exhaust all conditions and possibilities encountered in building, but the system of grillage footings would seem to meet most of the general conditions in practice, all special cases demanding their own particular treatment.

Table of Loads on Columns.

American Practice.

No. of Column.	Total load dead and live in tons.	Estimated live load in tons.	Dead load in tons.	Area in sq. ft. of Footings, based upon 4 tons per sq. ft. and total dead and live loads.	Dead load divided by Area of Footings.	Resultant Areas of Footings secured by dividing dead loads by least unit (2.34).
1	245	37	208	62	3.35	89
2	342	74	268	86	3.12	115
3	468	88	380	117	3.25	162
4	228	50	178	57	3.12	76
*5	330	136	194	83	2.34	83
6	503	157	346	126	2.75	148
*7	74	8	66	19	3.47	28
8	118	20	98	30	3.26	42
9	395	109	286	99	2.90	122
10	434	172	262	109	2.40	112
11	535	154	381	134	2.84	163
12	324	77	247	81	3.05	106
13	339	136	203	85	2.39	87
14	229	62	167	57	2.93	71
15	205	42	163	51	3.20	70
16	419	118	301	105	2.87	129
17	46	16	30	12	2.50	13
18	393	112	281	98	2.89	120
19	203	37	166	51	3.26	71
20	339	100	239	85	2.81	102
21	372	152	220	93	2.37	94
22	199	44	155	50	3.10	66
23	243	53	190	61	3.11	81
24	222	35	187	56	3.34	80
25	267	70	197	67	2.94	84
26	329	86	243	82	2.97	104
27	284	52	232	71	3.26	100

*Two extreme cases where difference of ratios is greatest, namely, column No. 5, an interior column, with smallest dead load ratio, and column No. 7, a wall column, with largest dead load ratio.

The tons given are of 2,000 lbs., as adopted in American practice: not 2,240 lbs., as followed in this country.

THE REBUILDING OF BLAGDON PARISH CHURCH is to be undertaken at a cost of £12,000, Lord Winterstoke having placed this sum at the disposal of the trustees.

THE BRITISH FLOORING CO. (W. A. Osborne), of 152, Gray's Inn Road, London, W.C., have secured a second contract for their jointless floor "Cementolith" at the Assay Office, Birmingham, and a large marble tile contract at Moxhall Hall, both for Messrs. Ewen Harper and Brother, architects; also contracts for mosaic, marble terrazzo, parquet and wood block floors at Edmonton, Gorseinon, Weybridge and Great Yarmouth. They have appointed Messrs. Chadwick and Rayner, of Talbot Place, Dublin, as their Irish agents.

RETAINING WALLS IN THEORY AND PRACTICE.

By T. E. COLEMAN.

Introduction.

The successful designing of a retaining wall requires that the first essential—stability—shall be combined with true economy in construction. This result can only be attained by a careful consideration of the site, foundation, materials available, and an intimate knowledge of the nature and extent of the forces which the wall must withstand. Originally, a retaining wall referred only to a wall of brick, stone, or other suitable materials, for the retention of an earthen embankment. The term, however, now frequently includes walls for the retention of water, etc., so that the enclosure walls of reservoirs, docks, gasholder tanks, sea walls, and other similar structures are also referred to by the same general expression.

Walls which are built for the purpose of facing or breasting a slope or cutting, to prevent the disintegration of the exposed face of the excavation—rather than for the actual retention of the materials behind—are usually known as "face" or "breast" walls. They are intended only to provide a surface or skin protection against the weather, and are not designed to counteract any thrusting action of the materials to which they form a covering.

The simplest form of retaining wall consists of a vertical wall of uniform thickness as shown in Fig. 1, but a similar wall possesses much greater resistance to overturning when built on the slope or "batter." Fig. 2 shows a "battering retaining wall" of uniform thickness, and by comparison with Fig. 1 it is obvious that its general stability is much greater than a similar wall built vertically. Fig. 3 is another arrangement, with "curved battering face," the wall being of uniform thickness.

In the sections referred to above, the thickness of the wall is the same throughout, but, bulk for bulk, a relatively stronger retaining wall can be obtained by decreasing the thickness towards the top, and increasing it towards the bottom, so that the thickness at any part may be directly proportional to the forces acting upon it. Fig. 4 shows the section of a vertical retaining wall arranged with "offsets" or "steps" at the back. Fig. 5 is a similar section, but with battered face; whilst Fig. 6 is finished with battered face and vertical at back. A retaining wall with "curved battering face" and arranged with offsets at back is indicated in Fig. 7. This latter form is largely adopted for dock-walls, sea-walls, etc. The construction shown in Fig. 6 is well adapted for concrete walls, whilst the remainder are equally suited for brickwork, masonry, or concrete.

Retaining walls for earthen embankments should be filled in immediately behind the back of the wall, for a thickness of at least 12 inches, with rubble or brick rubbish, so as to form a "French drain." Weepholes, formed with drain pipes of 3 ins. diameter, should be carried through the wall from back to front, in order to permit the escape of any water which may find its way to the back of the wall. A provision of three weepholes to every 40 or 50 superficial feet of wall area will generally suffice.

It is desirable that the "face slope," or "battered face" of retaining walls built in brickwork or masonry should not exceed 1 in 5, so as to prevent rain, frost, or vegetable growth entering the joints and injuring the wall. As a further precaution all face joints should be carefully pointed in cement mortar, for better protection against the weather. The bed joints of battered retaining walls should be laid at right angles to the face slope.

A retaining wall may be constructed with a series of projections or abutments on the face or back. When the projections are arranged in front of the wall, they are termed "buttresses," but when they are placed at the back they are known as "counterforts." Figs. 8 and 9 are the plan and section of a retaining wall with buttresses, whilst Figs. 10 and 11 show a similar wall having counterforts.

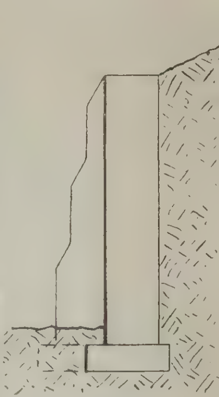


FIG. 9.

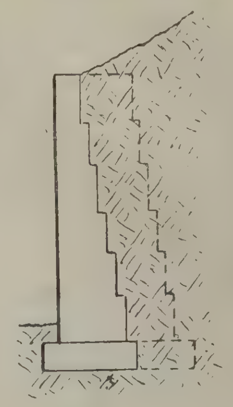


FIG. 11.

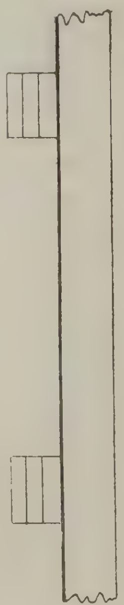


FIG. 8

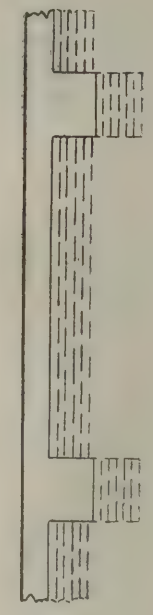


FIG. 10.

A form of retaining wall known as a "vaulted retaining wall" is sometimes adopted where a very high bank of earth must be retained. It consists of a wall having counterforts connected with a series of relieving arches (called "counter-arches") in one or more tiers. Figs. 12 and 13 show the section and plan of a vaulted retaining wall with two tiers of counter-arches. The general type of construction here indicated effects a considerable economy in materials, for a wall of this description requires much less than would be necessary for a solid retaining wall of the same strength and height.

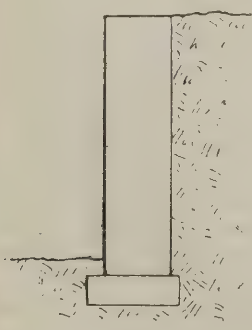


FIG. 1.

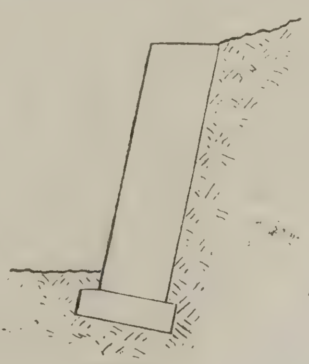


FIG. 2.

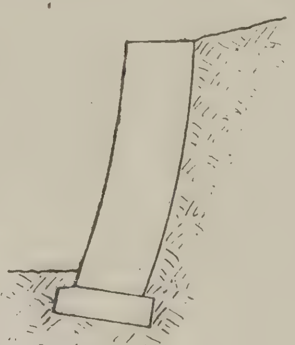


FIG. 3.

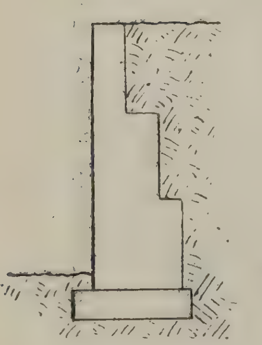


FIG. 4.

FIG. 5.

FIG. 6.

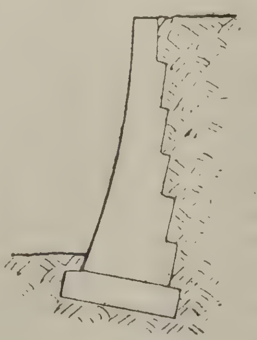


FIG. 7.

A "*buttressed arched horizontal retaining wall*" consists of a series of buttresses with horizontal arches turned between them, as indicated by the plan and section given in Figs. 14 and 15. This form is well adapted to resist great pressures, and has been largely used in railway engineering works. The section in Fig. 15 is arranged with relieving arches connecting the piers near the top of the wall.

The stability of retaining walls may also

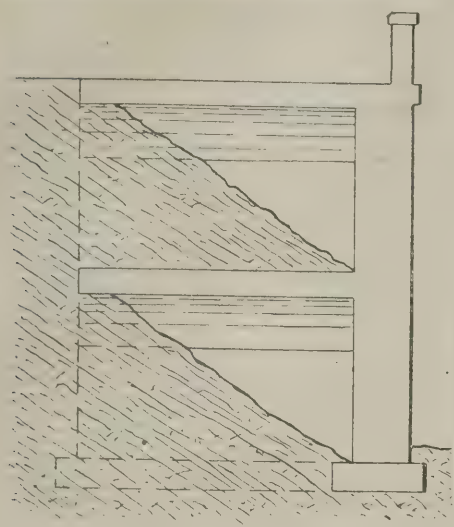


FIG. 12.

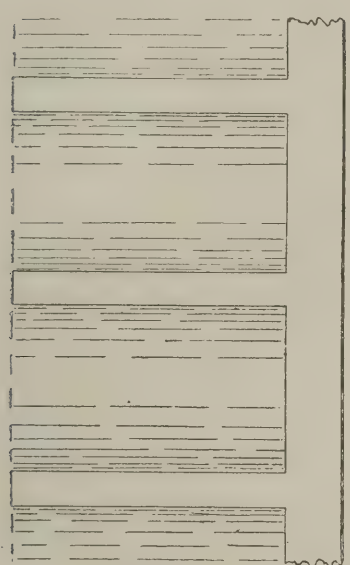


FIG. 13.

be increased by means of "*land ties*," as shown in Fig. 16. They consist of stout iron rods or bars connecting the face of the wall with an anchor plate embedded in the solid earth at some distance from the back of the wall. Land ties may often be usefully adopted in cases of local weakness in existing walls.

In military engineering the retaining walls for earth embankments, ramparts, &c., are known as "*revetment*" walls. A revetment wall must not only be capable of resisting earth pressure from behind, but must also be arranged to withstand the destructive effects of artillery fire. "*Vaulted revetment walls*," or "Rêvetments en Dêcharge," consist of an ordinary revetment wall with a series of counter arches behind, similar to the arrangement indicated in Figs. 12 and 13.

A "surcharged retaining wall" consists of a wall supporting a bank of earth sloping from the top of the wall and rising above it. This slope may of course form any angle between the horizontal and the maximum incline at which the earth will permanently stand. When the surcharge rises only to a certain height, and is then finished with a horizontal top, it is known as a "definite surcharge." For ordinary embankments the earth is sloped to a certain height, and afterwards finished as a level plateau. The vertical distance between the top of the wall and the embankment is called the "height of the surcharge." Fig. 17 shows a retaining wall with definite surcharge, the distance between A and B being the height of the surcharge.

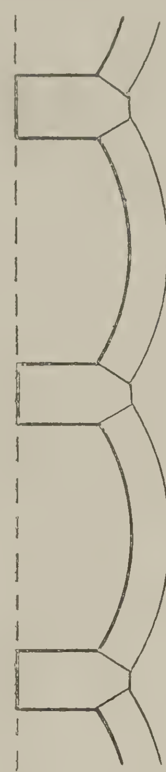


FIG. 14.

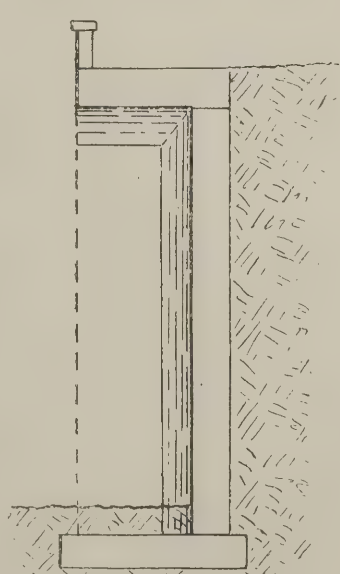


FIG. 15.

(*To be continued.*)

THE PORTLAND CEMENT TRADE.

As might be expected, trading conditions during the past month in the Portland cement industry have been unsatisfactory. The demand is as slack as it usually is at this time of the year, and prices show their usual mid-winter ease. All building and constructional work has been much interfered with by adverse weather conditions, not only in this country but abroad. There appears, however, to be a vast amount of heavy work in contemplation, and this, together with the normal increase in demand in the early spring, should soon bring about some improvement. Now that money conditions too are more favourable, it is more than likely that we shall soon witness more activity in Government and municipal enterprises. Meanwhile, the position is that prices are being quoted which represent bare cost, so that manufacturers are anxiously looking forward to better times, and are disinclined to quote for forward delivery, excepting at an advance on the figures they will take for prompt loading.

The London Master Builders' Association Diary and Handbook, 1908, has reached us. It is published from the offices of the Association, 31 and 32, Bedford Street, Strand, price 2s. 6d.

National Federation of Building Trade Employers.—At the annual meeting of the National Federation of Building Trades Employers of Great Britain and Ireland held in London on Wednesday last, Mr. C. H. Barnsley, of Birmingham, was elected president. For three years Mr. Barnsley wa president of the Birmingham Master Builders' Association, and under exceptional circumstances he accepted in 1903 the presidency of the Midland Centre of the National Federation, whilst in the following year he was appointed president of the Institute of Builders. In view of the honour conferred upon one of their colleagues, the Birmingham builders invited the members of the National Federation to hold their next half-yearly meeting in this city. The invitation has been accepted, and the meeting, which will probably be preceded by a banquet, will be held towards the end of July next.

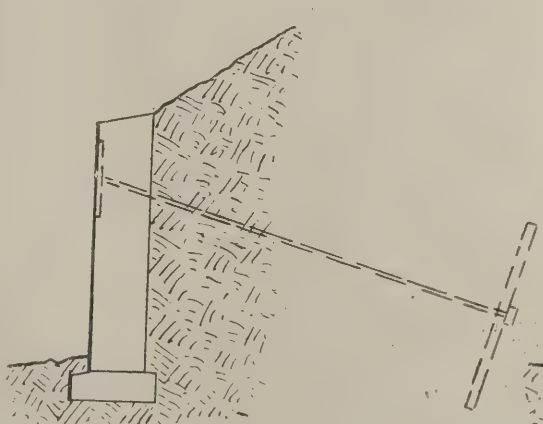


FIG. 16.

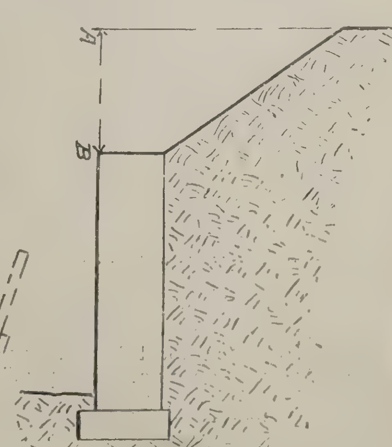


FIG. 17.

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

Plumbers' Work.

A.B. writes: "A contract for alterations and additions to a mansion house was completed more than three years ago. The architect asked the contractors to allow the final certificate to lie over until the water-supply was put in (which was not in the original contract), as he would like to see the plumbers' pipes tested before granting it. By the time this was arranged and completed, two years had passed, the plumbers' work then being found in order. The proprietor has since occupied the house for a year, during which time the contractors have been pressing for a settlement. The architect was always perfectly satisfied with the work and had no faults to find, but the proprietor, who was abroad all the time the work was going on, is not satisfied, and even threatens to claim damages from the contractors for, as he avers, the disgraceful state in which some of the work was done. In what position does the contractor stand?"

You do not state that there was a written contract with conditions, but no doubt that would be the case in a building of apparently some magnitude. Those "conditions," if in existence, govern the terms of the contract and should be followed. However that may be, it is evident that the first thing the builders should now do is to apply to the architect for his "final certificate." If he gives it, presumably the matter will be readily settled. If he withholds it, I advise the contractors to place the matter in the hands of their solicitor, after due warning has been given to the employer and the architect. Three years is an unreasonably long time to delay such a matter.

X.

Building up to Boundary.

WOODFORD GREEN.—H.C. writes: "What are the rights of a person who desires to build a wall right up to the edge of his ground which adjoins the (vacant) ground of another owner? It is not desired to build a party wall, nor to set the wall back so that the footings are on our own land. The land is in the country and not within the London Building Act."

You have every right to build upon your own land to the last inch, but of course you must project neither footings nor copes over your neighbour's land. I suggest that you should build a boundary wall without any projected footings on the far side, but with rather wider footings upon your own side; finish it with a cope which slopes and drips towards your own property, keeping everything quite straight and flush with the face of the wall upon the side which is towards the adjoining owner.

X.

Local Boards.

GLASGOW.— X.Y.Z. writes: "Kindly inform me if a member of a local board can be employed as architect by a combination board, one-third of which is composed of members from the local board, but of whose number he does not form part."

There is, I believe, no legal impediment to the course suggested. Whether it is desirable or wise depends very greatly upon circumstances.

A.

Dampness in Buildings.

Referring to the enquiry under this title in a recent issue, an article on "The Protection of Houses from Damp, Cold, Heat, and Noise," by Mr. R. W. Carden, appeared in THE BUILDERS' JOURNAL for February 20th, 1901.

Sewers and Surface Water.

CAMBRIDGE.—BOXWOOD writes: "I am obliged to you for the reply to my enquiry on page 52 of your issue for January 15th. I would mention, however, that there is a storm-water sewer available in the adjoining parish, and we wish to join it at once, and can get no satisfactory reply from the rural district council, although their surveyor had the plans and sections showing the surface-water drain before him when the road was formed, and we have made formal application to connect, accompanied by plan and section."

In further reply to this enquiry, I am of opinion that the same right exists to connect with a storm-water drain as there is with a foul-water sewer (see Public Health Act, 1875, and its amendments). The rural district council, as the sanitary authority of the district, may have by-laws bearing upon the construction of the new road and sewer, but they must either accept or reject the plans, and unless there is something more than appears in the details now and previously given, I am at a loss to understand where the matter hangs fire. Your legal remedy is by mandamus of the High Court, but I recommend persuasion rather than compulsion if anyway possible.

F.S.I.

Cost of Cottage Buildings.

HARROW.—COTTAGE BUILDER writes: (1) Can cottages be built in 9in. concrete walls with timber framing more cheaply than 9in. brickwork, assuming average country prices? (2) Would you recommend the use of compo-board as a wall lining instead of ordinary plastering, where external walls are only timber framing with tile hanging? Would compo-boarding be a better non-conductor, and would it be more economical? (3) At what price ought cottages to cube when constructed of 9in. concrete or brick wall on ground floor, timber and tile-hanging wall on first floor, timber and roofs? Very plain finishings inside. (4) What would be an average price for building land in a quiet country town of 5,000 inhabitants?"

(1) Certainly not—even if 9in. were thick enough for concrete walls. (2) I fear my answer must again be in the negative. Compo-board is useful in confined spaces, and I believe has been rather extensively used for such purposes as cubicles in barracks, but it has its limitations. (3) The usually accepted price per cub. ft. for cottages is 4d., but they must be very plain at this price, and I think they more often cost 5d. or 6d., the price of labour having increased so vastly during the last ten years. (4) A very wide question, and difficult to answer. If you require the land for cottage building you would probably pay 25s. or 30s. per foot frontage (depth 120 to 160ft.) on the outskirts of such a town.

F.S.I.

Division of Fees.

MANCHESTER.—J. T. writes as follows in regard to the enquiry about division of fees on p. 75 of our issue for January 22nd:—"If an architect pays, unknown to the client, a commission to a friend for introducing business, not because he is the best man for the work, but because he will pay for the introduction, surely, in the words of the Act, he 'corruptly gives an inducement for showing favour in relation to his principal's affairs.' In this connection may I call your attention to the following resolution of the Council of the Manchester Society of Architects, passed last year: 'That the Council strongly condemns the offer or acceptance by tradesmen, agents, architects, and others, of all or any commissions to induce business; and that such practices shall be construed as being calculated to bring discredit on the profession, as set forth in Article 64 of the articles of Association.'"

Repairs to Cottage.

PROPERTY writes: "I purchased recently an occupied cottage which is in a more or less dilapidated condition. I wish to thoroughly repair the cottage, and for that purpose I must take the roof completely off, together with part of the front, back, and gable walls, and rebuild again. I have given the tenant notice to quit, but he has failed to comply: he has also failed to pay the rent and is more than two months in arrears. It is essential that I should commence the repairs at once, i.e., before the statutory time required for an ejectment order will elapse. Can I legally proceed with the repairs while the tenant still occupies the premises?"

If you have given your tenant a legal notice to quit (i.e., one in accordance with the term of his tenancy), he has now become merely a trespasser, and you may therefore pull down the house, or remove the roof, just as you please. As a measure of precaution, I advise you to give him written notice that you propose to do this; you should also take care that no damage be done to his furniture beyond what is unavoidable. Be careful to accept no rent for the period he has stayed beyond his notice, or you may start a fresh tenancy.

C.

New London Buildings.

At yesterday's meeting of the London County Council the Building Acts Committee reported the following applications under the London Building Act, 1894, their recommendations as to consent or refusal being appended in *italics*:—

Eight one-storey buildings upon a site at the rear of Nos. 376 to 392 Garratt Lane, Wandsworth, and approached out of the south-eastern side of Summerley Street, on the application of S. Boothman (*consent*).

Porches to six houses on the northern side of Canterbury Grove, Norwood, on the application of J. Wilson (*consent*).

King's College Hospital, with projections, on the south-western side of Denmark Hill, Norwood, to abut also upon the southern side of Bessemer Road, on the application of W. A. Pite, on behalf of the Building Committee of King's College Hospital (*consent*).

Oriel window and cellar in front of No. 24, Blomfield Road, Paddington, on the application of G. Remington, on behalf of J. Neave (*consent*).

Buildings on the south-eastern side of Norwood Road, Herne Hill, on the application of May and Perrin, on behalf of A. J. Perrin (*consent*).

Buildings on the northern side of Lavender Hill, Battersea, on the application of A. W. Taylor and Co. (*refusal*).

Buildings on the eastern side of Palmer Street, Westminster, on the application of Barlow and Roberts (*consent*).

Projecting iron and glass shelter to the Hotel Curzon, Nos. 23, and 24, Bolton Street, Piccadilly, on the application of Cubitt, Nichols, Sons, and Chuter, on behalf of S. Harwath (*consent*).

Thirty-six houses on the northern side of Egerton Road, Stamford Hill, on the application of P. Roche (*consent*).

Additions at the flank and rear of No. 95, Hornsey Road, Islington, to abut upon Shelburne Road, on the application of Thorpe, Furniss and Elkington, on behalf of E. L. Spring (*consent*).

PALAZZO DURAZZO, GENOA: ENTRANCE STAIRS. BARTOLOMMEO BIANCO, ARCHITECT.

February 12, 1908. Volume 27, No. 679.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 354, Westminster.

Date of Publication: The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The "Fire-Resisting Construction Section," is given in this Issue.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

The Layman's Adjectives.

It is always interesting, and often amusing, to hear the layman giving his opinions about architecture; he is so delightfully dogmatic and sweeping in his criticism; and he "knows what he likes," although quite unable to explain intelligibly "why he likes." We have had some good examples of this sort of criticism during the past week, relative to Mr. Ralph Knott's selected design for the London County Hall—especially at the meeting of the London County Council. There has been, indeed, quite a phenomenal shower of ugly adjectives. Thus, one member of the L.C.C.—"This flat design—this plan with the levelness of the fens of Lincolnshire (plans, by the way, are usually flat). Was the guiding authority of the greatest metropolis in the world going to erect a building with 200 windows in its front, all nearly the same size, a building with equal stacks of chimneys, like so many policemen standing at regular intervals, and a sort of cupola representing the balance on which the machine was hung? . . . A dumpy and squat building, with too much the appearance of a warehouse, designed in a cold, grim and soulless style, and presenting a front of terrible monotony." Or, again, another layman, thus: "It is more than an inspiration; it is a nightmare. It seems to rest on the riverside with the dead weight of an intellectual indigestion." Again: "A long level mass devoid of any break, faithfully copied from a gentleman's stable, enlarged, and surmounted by eight chimney stacks, and the customary little belfry." Or, again, short and sweet: "A long perforated box." So much for the lay critic. It hardly needs pointing out that the architecture which commands his admiration is, to put it politely, of another kind. With these opinions of the man in the street before us, it is curious to turn to the assessors' report. "A fine design . . . which shows the greatest promise of a worthy result, and best deals with the problem set. . . . It is a forcible and artistic suggestion which conveys to us the purpose for which it is to be erected, and is almost entirely without costly and unnecessary features; moreover, we are of opinion that the estimated cost is a fair one, and that the building could probably be erected within the sum named in instruction No. 34. While making this award we wish to record our opinion that the great projection of the centre portion of the river front requires modification, and that the fine flight of steps into the river beyond the face of the embankment wall, described as 'undesirable' in the replies to competitors' questions, should be omitted, as indeed the author in his report himself suggests. There are other points in the plan that require modification, but the brilliant qualities of the design far outweigh, in our opinion, these and other comparatvely unimportant defects." Everyone, of course, is entitled to his own opinion, but, among persons whose judgment of architectural design is worth listening to, there can be no question that the assessors' estimate is correct, and the public estimate is wrong; at the same time we certainly do share, to some extent, in the adverse criticism of the elevation of the building. When the assessors' award was made known, we were glad to hear that this important work had fallen to the lot of a young and unknown man. We hoped that history would here repeat itself, and that Mr. Knott's design would prove to be as far in advance of those of his older and more experienced fellow competitors as was that of Elmes in the case of the competition for St. George's Hall, Liverpool. Unfortunately, we do not find the case parallel with the one we have instanced. On looking at the drawings it is clear that, like most of our architects to-day, Mr. Knott is quite uninfluenced either by the works of the great men of the 18th century of his own country or by the modern practices and precepts of the "Beaux Arts" and the Parisian *ateliers*, and this competition is only another instance of the fact that while in no other country is there to be found such charming domestic work as English architects produce with so little apparent effort, in monumental design we are far behind the French and the Americans.

Bournemouth Municipal Buildings.

Two letters appear in our correspondence columns this week relative to some recent remarks concerning the proposed competition for new municipal buildings at Bournemouth. One of these letters bears the signature of Messrs. J. H. Brewerton, F.R.I.B.A., Mr. W. F. Reynolds, and Mr. Sydney Tugwell, all of whom, we believe, are engaged in practice as architects at Bournemouth. With regard to the first part of our correspondents' letter, we are quite in accord with their views, as not only are we out of sympathy with the action of municipalities in allowing borough engineers, who already receive adequate salaries, to carry out "architectural works," but we entirely disapprove of this constantly-increasing practice, which is having a most disastrous influence upon the architecture of the country. Moreover, as a general principle, we are also in agreement with our correspondents in their contention that, wherever possible, architectural work

of a public nature should be the subject of open competition, yet in this particular case we must join issue with them. Theoretically the open competition system is the fairest method that can be devised, but we are quite unable to assent to the proposition that its adoption necessarily secures either "the success of the best design" or that it removes "all taint of favouritism," or that it is one that "is calculated to obtain the most satisfactory result in the expenditure of public money," as it is common knowledge that frequently it does nothing of the kind. The object of a competition is, or should be, to enable its promoters to obtain the best design possible, subject to their own scheduled requirements as to cost and accommodation, and generally, with this laudable object in view, the services are requisitioned of a professional assessor who, occasionally, assumes the entire responsibility for the award. Now, the average assessor to-day has been imperfectly educated in the art of architecture, which is, unfortunately, the only art requiring *mathematical definiteness.* Consequently, he neither understands nor appreciates designs which, even approximately, exemplify the system of training long since adopted by French and American architects, a system which has placed them, as designers of monumental architectural works, far in advance of the architects of this country, where the first principles of architecture, consisting of geometrical "setting out," balance, symmetry and proportion are generally regarded with disfavour. If the truth of this statement be admitted (and it can be easily verified), a design possessing these fundamental essentials of the art of architecture is likely to be passed over by most assessors, and we have therefore no hesitation in saying (1) that more often than not the competition system, as at present conducted, fails to secure the success of the best possible design, (2) that it does not, invariably, remove all taint of favouritism, (3) that until the decadent art of architecture is again understood and methodically studied in England, both by its practitioners and the general public, the system of competition cannot be relied upon for obtaining "the most satisfactory result in the expenditure of public money." For these, and other reasons, we do not consider that the Bournemouth Corporation is at all likely to secure, by means of an open competition, a better architectural design, or one of a more dignified and suitable character, or one in which the internal arrangements will be, in any respect, superior to those comprised in the masterly and scholarly scheme already prepared by Messrs. Mallows and Lacey, with the full approval and sanction of the Corporation. On the contrary, it is more than probable that, in the event of a public competition, the chosen design will be one of quite an ordinary type of architecture, and we still think the Corporation's proposal to dismiss their present architects is both unfair and, in the best interests of the town, undesirable. We very much regret that the claims of our correspondents, in common with those of the other local architects, received so little consideration when the scheme for the erection of the new buildings was first under discussion by the Bournemouth Town Council, yet, if only for that very reason, we think on reconsideration they will not feel inclined to encourage the Corporation to commit what may perhaps be fairly described as a second act of injustice. With regard to the letter from the secretary of the Bournemouth Residents' Association, we are glad to learn that the policy of the Association has been in no way influenced by any action of the local architects. But whilst we fully admit that the Bournemouth Residents' Association has every right to lodge a protest against what it regards as the excessive cost of the scheme for the proposed municipal offices, we feel confident that the architectural welfare of the town will not be advanced by instituting, at this late stage of the proceedings, a public competition for the building.

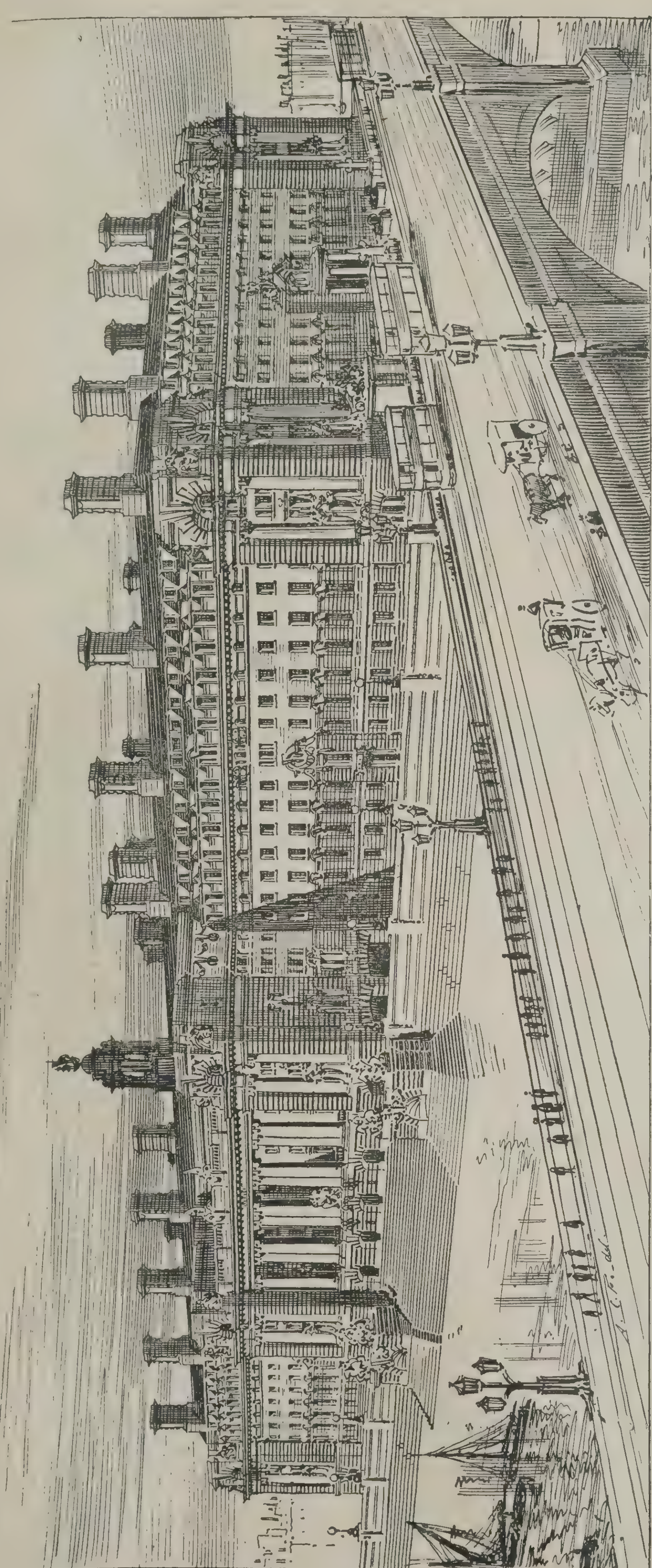
The late E. W. Mountford, F.R.I.B.A.

The Late Mr. Mountford. All architects will have read with deep regret the announcement of the death of Mr. E. W. Mountford, F.R.I.B.A., who died in London on Thursday last, from pneumonia. As a designer of municipal buildings he held a foremost place among the profession, and one can point to buildings of this class erected in most of the chief cities of the Kingdom; beginning with his first notable success at Sheffield Town Hall, and concluding with the new Central Criminal Court in London—both the outcome of competitions. Mr. Mountford was born at Shipton-on-Stour, Worcestershire, in 1855, and was articled to Messrs. Habershon and Pite, architects, of Bloomsbury Square, in 1872. He began practising for himself in 1881, and in 1890 won the Sheffield Town Hall competition. He designed the Battersea Town Hall and Polytechnic, St. Olave's Grammar School, Southwark, the Northampton Institute, Clerkenwell, and the Liverpool Museum and Technical School. The last-named is a particularly fine design. But, as indicated, Mr. Mountford's chief work is the new Central Criminal Court—a building which, if not free from architectural fault, is a good example of modern English Renaissance, and especially successful in its interior design. Mr. Mountford took part in the London County Hall competition, having been one of the eight architects invited to submit designs.

Some Frescoes by Hogarth. In the weekly record of events published under the title of "What's On," a series of articles dealing with "Vanishing London" has been commenced. The first article, in the issue of February 8th, deals with No. 75, Dean Street, externally an unimposing house, next to the Royalty Theatre, Soho, but containing a series of frescoes, by Hogarth, around three sides of the staircase well. The frescoes represent a colonnade, with balustrading, over which figures are leaning, apparently intent upon any person who may be ascending or descending the stair. They are covered with dust and dirt, and in places almost invisible, but are in excellent preservation, and could be restored with very little trouble. The house itself, once the residence of Sir James Thornhill, is a fine specimen of early seventeenth-century work, with a Pergolesi fireplace in marble in one of the rooms, and other interesting and characteristic features of the period. "This is one of the historical houses of Vanishing London that will soon have disappeared. The building is already doomed to make place for some twentieth-century eyesore. We can merely regret it. Our experience with Crosby Hall has shown that the public takes little interest in these matters, or a merely sentimental interest that does not reach its pocket. We do not expect any agitation on behalf of the rescue of Hogarth's one effort in the direction of fresco painting, but surely the thing must have some intrinsic value to those who collect for the sake of accumulating objects of pecuniary worth. The house may be condemned, but is it beyond our powers of invention and mechanical device to save the frescoes? We commend this question in the first place to the vendors of the building, and in the second to the collector, whether virtuoso or mere accumulator."

TEMPORARY LAW COURTS.—Two temporary, but substantial, law courts are being erected at the Carey Street end of the Judges' Quadrangle of the Royal Courts of Justice, under the direction of H.M. Office of Works. The work is expected to be completed in about two months.

ROYAL INSTITUTE OF THE ARCHITECTS OF IRELAND.—The usual monthly meeting of the Council of this Institute was held in Dublin on February 3rd, the chair being occupied by Mr. Fredk. Batchelor, president. A letter was read from the Royal Institute of British Architects stating that the students' prize drawings would be sent to Dublin for exhibition in the first week in May. Four members of the Council were nominated to confer with the delegates of the Architectural Association of Ireland as to the preparation of a syllabus for the proposed examination for a Studentship class.



PERSPECTIVE OF THE SELECTED DESIGN FOR THE LONDON COUNTY HALL. RALPH KNOTT, ARCHITECT.

LONDON COUNTY HALL COMPETITION

Second Notice.

Messrs. Russell and Cooper send in what is, in the writer's opinion, the best architectural design submitted. There is no sense of undue and unusual striving after effect in it, the fenestration of the fronts is admirable, and the use of the Order pleasing, well-proportioned and suitable. The central feature, which is carried up over the members' hall, is most effectively designed, and its receding stages are cleverly and carefully proportioned. Sculpture accentuates parts of the design, but is properly subordinated to the architectural treatment. While Mr. Atkinson's design, in spite of its fine qualities, gives one the effect somewhat of a gorgeous piece of stage scenery, this design by Messrs. Russell and Cooper, if well carried out, would have been worthy of its proximity to Somerset House. It is the only design which is of the same calibre as the traditional work of the English Renaissance. The plan is ably conceived and exceedingly well worked out in detail. There is probably very little of it which would have had to be radically altered in a working scheme; yet it has not the simplicity of arrangement of the winning design, and the lighting areas are, in many cases, smaller. In spite of any defects, however, it is a fine municipal group, and one can well imagine that the assessors must have had difficulty in passing it by.

Mr. Frank Atkinson's design is one of the most remarkable schemes submitted. It is the very antithesis of the winning design, as in it all idea of economy has been put to one side. It is well and symmetrically laid out with four large lighting areas (50ft. by 147ft. in size), smaller areas, light corridors, and lavatory blocks; as however, these areas measure only 15ft. by 36ft., they would be almost useless for their purpose on the lower 180ft. by 65ft. is placed next the principal floors. A magnificent *Salle d'attente*, entrance from Belvedere Road, and at the back of this, within a comparatively short distance of one another, are two principal staircases. This reduplication of features where one would have amply sufficed is clearly a fault. The members' corridors, reception halls, etc., are on the same colossal scale. There is much clever detail in the elevations and sections, but with all its ability the design fails to commend itself to the writer's approval.

Mr. Hare's design must have been one of the three or four which were in the running. The courtyards are well arranged and ample in size. The arrangement of the principal staircase (reached from the large quadrangle next the Westminster Bridge Road and also from the front to the Belvedere Road) is a clever solution of the difficult question as to which of the two approaches should be the principal one. The cloak-rooms are placed on a lower floor, but there seems little or no objection to this. The council chamber, library, dining-room and members' room occupy the centre of the principal floor, which is very well laid out. The columned terrace is flanked by the projections formed by the large committee rooms. The writer thinks that the circular colonnade in the principal court is a mistake, and that a repetition of the square building line would have been more pleasing. The elevations, though not inspired, are, on the whole, well designed, but the varying inter-columniation is unfortunate and unpleasant, and the treatment of the committee rooms on

the river front, and their juxtaposition with the two towers that break the skyline, is a little unhappy. Taken altogether, however, it is an able and well conceived design. The planning of the basement, indeed, seems the one only really weak point of the lay-out.

One is somewhat surprised that such persistent rumour should have associated Messrs. Warwick and Hall with the first place, as the writer considers their design fails both in plan and elevation. The principal entrance faces the Westminster Bridge Road, from which a staircase leads to the council chamber. This portion of the design is very well and carefully thought out, and the manner in which it can be shut off from the remainder of the building is admirable. The centre part of the plan is taken up with a circular court, which (as it has no external access) has the appearance of being completely lost. On the further side of this is the wing containing the library, which balances the council chamber. It will be seen that the lighting courts, with the exception of the circular one, are unarchitectural and irregular. The elevations, with an immensely lofty tower, dome, and turrets, are restless, the several features killing one another.

Mr. J. B. Fulton's scheme is more pleasing architecturally, but its merits are not of the highest order. The plan suffers from being too much cut up, some of the lighting areas being altogether too small. The hall in this case, as in many others, has proved a white elephant. Now that it is stated the county council have reported in favour of its abandonment, one is at a loss to know why competitors should have been given so much unnecessary trouble in planning it. It is another instance of the folly of issuing conditions before the promoters' views are fully ascertained.

Mr. Belcher sends in a disappointing scheme, especially in elevation. The river front is feeble, and lacks proportion, the two towers being unhappy in outline and the fenestration unpleasing. The plans are on good lines, but the scheme as a whole is weak and uninteresting.

Mr. Ernest George's design likewise fails in breadth of conception, both in plan and elevation. It is perhaps too much to expect that an architect who has given his life to the study of domestic architecture, and who has been, with Mr. Shaw, a pioneer in raising the level of contemporary work, should be able to succeed to the same extent with monumental design.

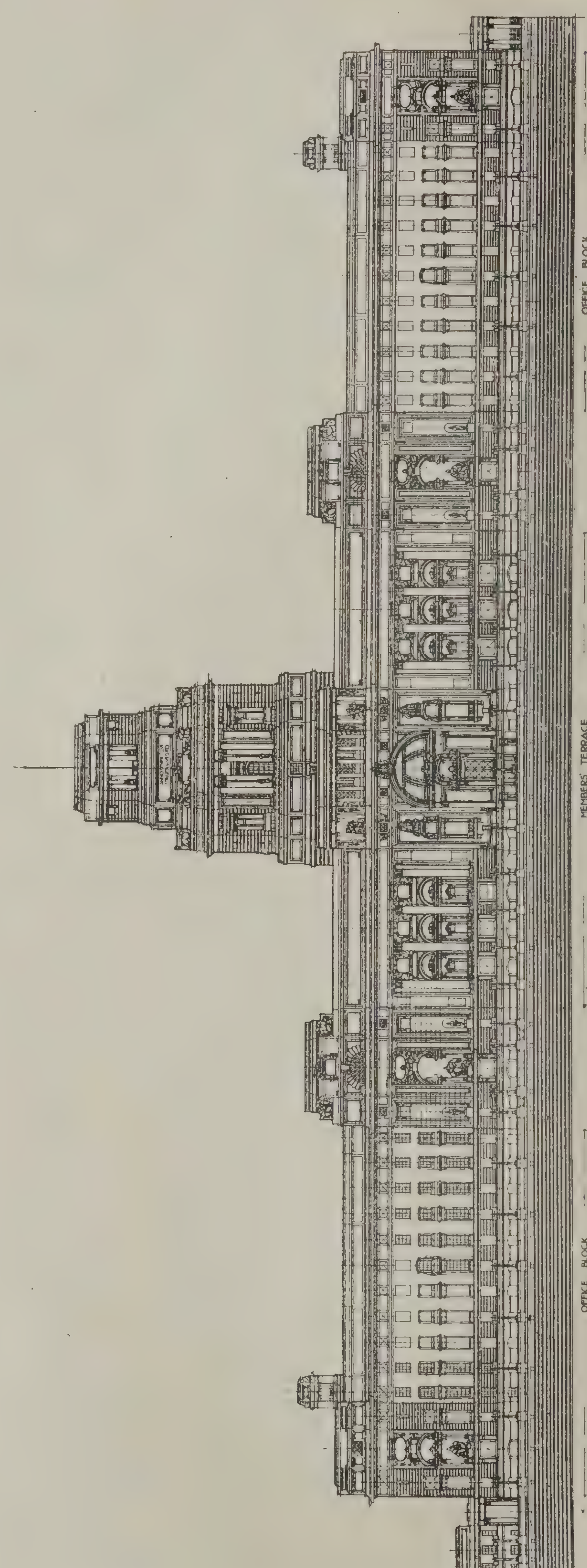
The scheme which Mr. Lutyens submits is remarkable, most carefully worked out in detail, and of much interest and originality; but his effort also shows the result of attempting an altogether different class of work to that in which he has made his reputation. The old scriptural saying that no man can serve two masters would seem to apply to architecture as to other things.

Mr. Marshall Mackenzie sends in a very clever and original plan, in which the blocks of buildings are arranged in segmental lines, sweeping back from the two extreme ends of the river front, the front being of lower height than the back one. The elevational treatment, however, is commonplace, and its high tower unfortunate in outline and design.

Mr. T. G. Jackson's design is also commonplace.

Messrs. Nicholson and Corlette submit the only Gothic design. Their plans show evidence of considerable thought, but the elevations more closely resemble work of

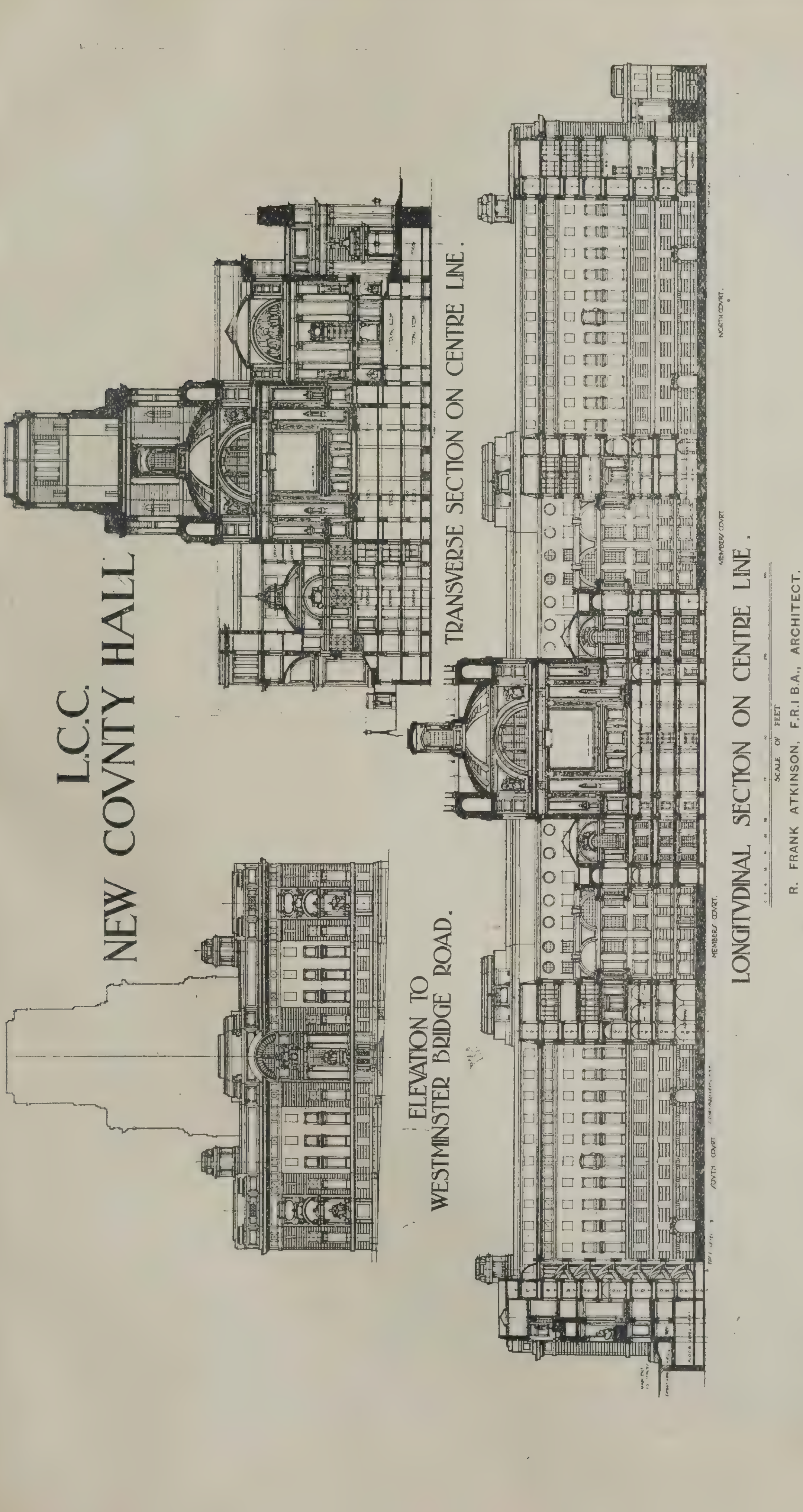
L.C.C. NEW COUNTY HALL



ELEVATION TO RIVER

SCALE OF FEET

R. FRANK-ATKINSON, F.R.I.B.A., ARCHITECT.



a domestic character than a great public building.

Mr. Flockhart's design is extremely interesting, and betrays evidence of the love of thoughtful design which is his strongest characteristic. The plans are on good lines, and carefully thought out, and the elevations, though not broad and dignified enough for the subject, are full of interesting design.

Messrs. Houston and Horne submit a scheme of considerable merit, though it fails to suggest the purposes of the building.

Messrs. Gardner and Hill's design shows well-considered plans, but their elevations are not of equal merit.

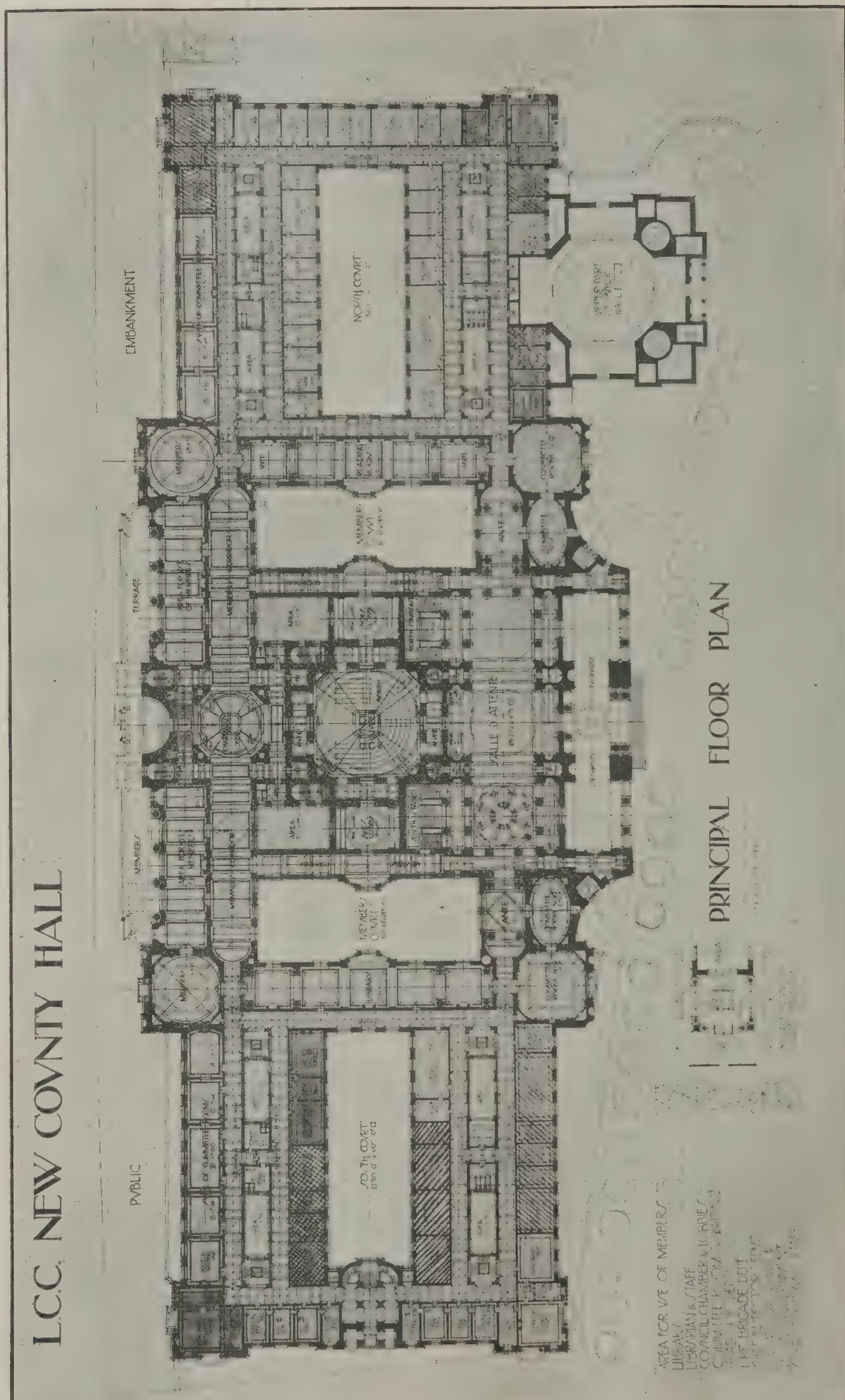
The design by the late Mr. Mountford shows good plans and quiet and simple elevations.

The remaining schemes do not call for any special notice, though there is good work in some of them.

Taken as a whole, the competition has ended better than its history might have warranted us to expect, but one feels that it is most unfortunate that the most important architectural competition of our time should not have been one conducted under better auspices. The best competitions are those for buildings the exact accommodation of which has been fixed and thought out beforehand, not competitions that are productive of designs which (as in this case) have to be more or less completely recast at the finish.

However, one hopes that, whatever is done, may in the tunity afforded by this great building.

A correspondent writes to the "Times" as follows:—"Among the modifications that will certainly be made to the accepted design for the new London County Council building I trust we shall have the correct spelling of the name, which appears on the drawings as 'Covnty Hall.' . . . At Charing Cross Hospital they have had the good sense to alter the original 'ovtpatients" and 'casvalty ward' to the proper spelling; and the absurdity of writing one letter when you mean another would, of course, be doubly absurd in the case of an educational body." The "V" in the lettering is, of course, simply the original Roman type; still, we quite agree that some alteration might be made to satisfy present-day writing; a compromise, perhaps, between the acute "V" and the rounded "U" would meet the case.


L.C.C. NEW COVNTY HALL
EMBANKMENT
TERRACE
MEMBERS
PVBLIC
NORTH COVRT
SOUTH COVRT
SALLE D'ATTENTE
LIBRARY
AREA FOR VSE OF MEMBERS
LIBRARY
LIBRARIAN & STAFF
COVNCIL CHAMBER & LOBBIES
FIRE BRIGADE DEPT
PRINCIPAL FLOOR PLAN
R. FRANK ATKINSON, F.R.I.B.A., ARCHITECT.

THE ARCHITECTURAL ASSOCIATION.

Mr. Harrison Townsend on Garages and Motor-Houses.

A meeting of the Architectural Association was held on Friday evening at 18, Tufton Street, Westminster, the chair being occupied by the president, Mr. Walter Cave, F.R.I.B.A.

The president announced, with deep regret, the death of Mr. E. W. Mountford, whose work, as one of the leading architects of the day, he referred to in appreciative terms. A vote of condolence with the widow and family was passed.

The following new members were elected:—Messrs. E. S. A. Baynes, G. S. Cockrill, G. D. Stanford, L. Burton, C. H. Lay, and A. T. Hardman; and it was announced that Messrs. A. E. Chasemore and A. E. Nightingale had been reinstated.

The president referred to the success of Mr. Ralph Knott in the London County Hall competition, and offered him, on behalf of the Association, their hearty congratulations.

A paper on "Garages and Motor-Houses" was then read by Mr. C. Harrison Townsend, F.R.I.B.A.

At the outset he said that for the purposes of his paper he had taken "garages" to mean public storing-places for automobiles (or, if not public, at all events on a large scale) and "motor-houses" to mean places where the private owner kept one or two cars for his own individual use.

Turning first to the details of motor-houses, Mr. Townsend said that, as regards the entrance doors, it was to be remembered that a car had very often to go in with its hood or luggage rail fixed, and perhaps a spare tyre or two on top; a height of 9ft., therefore, was desirable, with a clear width of 8ft. The entrance might be closed either by doors opening outwards, by sliding doors, or by revolving shutters. In the length of the house there should be a generous allowance, but 16ft. might be taken as a datum for the length of car. Continuing, Mr. Townsend said:—

For giving the car proper attention—oiling, cleaning and slight repairs—space should be arranged between it and the walls at each side and at each end. This should be at least 2ft. 6ins. where a pit is provided, but if the latter does not exist, and the car is raised for underwork, the space should be 3ft. or 3ft. 3ins. Of course, in the case of several cars standing side by side, there need only be 2ft. 6ins. or 3ft. between them.

So far, then, we have reached the internal size of the car-house: 16ft. + 2ft. 6ins. or 3ft. 3ins. + 2ft. 6ins. or 3ft. 3ins. = 21ft. or 22ft. 6ins. for the length, and 6ft. + 2ft. 6ins. or 3ft. 3ins. + 2ft. 6ins. or 3ft. 3ins. = 11ft. or 12ft. 6ins. as the width; 10ft. is the least width which is advisable.

For the motor-house for one or two cars not much height is required to the roof-plate, and 8ft. will be found a good minimum to start from.

Walls.

The walls should either be faced—at all events, to a height of about 4ft. from the ground—with glazed bricks or lined with tiles or such other material as is non-absorbent, and can be easily washed down. They should have a coved brick or tile at their junction with the floor, to avoid the harbouring of grease and dirt; all angles to recesses—such as that for the hydrant or the radiators—should be rounded; and there should be as few projecting features as possible. Just above the floor-level in each external wall should be inserted air-gratings. They should, where possible, be placed behind the small radiators. The gas resulting from the evaporation of petrol-spirit is heavier than the air, and the getting rid of it presents a problem all the more difficult as no principle based on upright extraction-shafts can be of any avail. I by no means agree with Sir D. Salomons in his "Badminton Library" volume that "the ventilation of a motor-car house is almost unnecessary."

Floors.

As regards the floor, in by far the larger number of the garages and motor-houses I have seen there is cement laid to a smooth finish and to falls. I do not, however, think this a very efficient material. The action of the dropped oil on its surface tends to rot and "take the virtue" out of the cement. Granolithic, with its large proportion of stone chips, distinctly offers less opportunity for this. Stone flags, laid not on a concrete bed but on sleeper walls for the advantage of the air-space beneath thus obtained, have been used by Sir D. Salomons, but they seem to add still further to the risk of the dangerous sparks that may result from the car coming in or going out with a chain or stud anti-skid appliance fixed on the tyres. Again, unless the space beneath is of considerable size—a cellar, in fact—there would be the danger of its forming a chamber where explosive gas could collect as the result of leakage. Some of the new floor compositions, of which so many are being placed on the market, may solve the question. Indeed, I am assured by the maker of one of these that it has successfully stood the test of daily and hard usage in a London garage of some size.

Drainage.

The drains should not be underground pipes, but open half-round channels, to avoid the danger of their becoming charged with explosive gas from leakages, and to allow the lubricating oil, which is apt to drop from a standing car, to be kept from the rubber tyres, upon which it has a highly injurious effect.

The Inspection Pit.

In dealing with automobiles we should recognise that we are in an evolutionary stage, and that on cause shown the principle that seemed admirable and efficient yesterday may well be discarded for something else to-day. It is so, in particular, with regard to the pit, the necessity for which no longer exists in the same measure as a few years back, and with which there is, therefore, a growing tendency to dispense. Much of the work which used to be done below the car can now be put in hand from above, though there still remains a distinct necessity for seeing to the underside of the chassis. For those who dispense with the pit there are various substitutes in the way of jacks, or the larger and more efficient "motor-car elevator," which tilts the car and reveals to the repairer the lower side of the chassis, at a height of about 4ft. from the ground.

In cases where it is incumbent to make use of the pit, the best size for this is 6ft. by 3ft. by 4ft. 6ins. or 4ft. 9ins. deep. Its sides should be lined either with glazed bricks or tiles, and it will be found convenient to form in them a recess on each side in which the chauffeur when at work can place his tools from time to time. Iron ring steps afford access to it. It is all but useless to attempt to ventilate the bottom of the pit, for, as I have said, no up-cast shafts avail with a gas which is heavier than air. An American expert strongly advocates the extension of the pit beyond the outer wall of the garage, as tending towards a certain amount of ventilation at all events, and as giving means of escape for the chauffeur, who would otherwise be shut up in a trap in case of fire. The covering of the pit should be a series of wide cover-boards 2ins. thick, with a sunk lift handle to each. They rest on the rebated edge of a 7 by 3 oak curb laid on the pit side. The floor of the pit should be dished to a grated sump in one corner. It will be found well to lay on the floor coarse sand, which should be constantly removed when impregnated and foul, and of course the proprietor will see to a liberal provision of drip-pans. In public or large garages the pit is usually of continuous length, so that several cars may be attended to at once.

It is not of great use placing a skylight, as is sometimes done, above the pit, since the car, when standing over the latter, naturally blocks out the light. A long low window quite near the floor is a better arrangement, and can be made also to help in the ventilation, which is so desirable.

A garage should be of fireproof construction, the roof no less than its other portions. In small and inexpensive buildings this is not always possible, but even then it is very desirable either to cover all exposed timbers with some such fire-resisting material as "Uralite."

Exterior to the motor-house proper a covered washing space should be provided, to allow of thorough washing down, whatever the weather may be. If the open sides of this are high enough, the glass roof—not a very satisfactory feature in design—is unnecessary; indeed, in bright sunny weather it is found objectionable, and in any case should be, and any skylight also, of wired rough plate-glass. In the floor of this covered space is sometimes placed the pit, but this position is open to the objection that, exposed as the car would be, the cold on a hard winter's day would expose the water-jacket of the engine to the danger of freezing, and would be rather hard on the chauffeur engaged for two or three hours working on it.

Petrol Storage.

The petrol store is a highly important feature of the garage. Petrol is an extremely volatile spirit, with a specific gravity of 680degs., and though its gas vapour when mixed with eight or ten times its volume of air forms simply a rich gas, which will burn without exploding, a larger proportion of air, about 17 or 20 to 1, forms a most explosive mixture. A naked light brought in contact with the gas has disastrous results, and the main object in arranging the place where the petrol is kept should be to avoid such a risk.

In view of the fact that we in England (under the regulations laid down by the Secretary of State) can store in one place and in approved safety cans as much as 60 gallons of volatile inflammable liquid, while in New York the maximum is limited to 10 gallons, the use of the underground storage tank is much more common, even for small garages, in the latter place than with us. There they are, moreover, limited by regulation to a maximum of 1,375 gallons of tank storage, while the amount with us is unlimited, but the licence which has to be obtained when more than 60 gallons of petrol are kept, or where the storehouse is within 20ft. of a building, is dependent on the London County Council Department being satisfied on the point of efficient security.

In England the spirit, if only in the tank of an automobile, does not bring the

premises in which the latter is placed under inspection by the authorities. In the case of a small garage it would be kept in 2-gallon cans, the store for which should, wherever possible, be at least 20ft. away from any other building, and should be of fire-proof materials, with iron door and its walls provided with ventilators having gauze protection. The floor of concrete, floated with cement, should be sunk below the ground level, and the door should have a raised sill. This sunk space is filled with sand. The cans should be close to the doors in order that they may be easily accessible, and that the chauffeur need never stand inside.

The latest version of the Secretary of State's Regulations for the storage of petrol, which became operative on August 15th last, should be carefully studied, even by those who keep but a small reserve of spirit. Perhaps the most notable restriction is that prohibiting the escape of even the smallest quantity of spirit into a sewer or drain.

The private owwer who keeps a small store in his garden has to take care to remember that if his petrol store is close to his boundary, and the adjacent owner chooses to put up an inflammable building, or even a hay-stack, within 20ft. of the store, the obligation is on the motor-house owner to give notice to the local authority (in London the London County Council) of his so keeping spirit, which brings the premises under the necessary supervision.

When spirit is kept in bulk to a moderate amount an ordinary galvanised iron tank sunk in the ground may be used, built in with either bricks or concrete, with a layer of the latter laid beneath it, the tank being fitted with a pump to draw off the spirit. The storage of the larger amount necessary for public garages is usually in 30ft. by 9ft. cylinder tanks, holding from 12,000 to 15,000 gallons. These should be buried at least 2ft. under ground, and be embedded in Portland cement concrete, say 12ins. thick, and have a vent pipe of iron (with a fine wire screen near the tank connection) carried some feet above the roof of the garage.

With regard to the exceptional care to be exercised in arranging the drainage, to which I have already referred, the London County Council publish detail drawings of both brick and cast-iron intercepting tanks through which all surface drainage must pass before entering the sewer. These, of which the depth is 4ft. 6ins. by 2ft. 6ins. square, are arranged in series, and ventilated by a 3-in. pipe.

Carbide Storage.

The carbide store, where one is found necessary, can, without notification to the London County Council, hold 5lbs. of carbide of calcium in 1-lb. hermetically sealed cans, and up to 28lbs. without a licence. It is advisable to arrange for the storage of this in a separate cupboard or store, which should be well ventilated.

Heating of Motor-house.

It is of high importance that there should be no risk of the temperature of the motor-house falling to freezing-point, and allowing the circulating water of the motor-engine to freeze. The motor-house is best when dry, but not unduly so. Its temperature should be about 60degs. Fah. The heating apparatus, of course, should have no opening from the motor-house, but be arranged with external access; a low-pressure system with radiators will be found the best. These may be placed as found advisable, but in a garage of any size there will be a considerable advantage if a cupboard be provided containing a small radiator, to be made use of when drying rugs of cushions, and with ventilation to allow of the escape of the resultant steam.

Provision Against Fire.

Provision against fire should be attained by means of hydrants, chemical extinguishers—of which there so many varieties—and by bins containing sand, which is most useful in extinguishing low running fires, since water thrown on burning spirit is of little use; indeed, would increase the danger.

Lighting.

The day-time lighting should be effected by windows which do not admit south sun, and if by skylights these should have the usual studio northern aspect. The Dunlop firm, by the way, recommend as the best light for the tyre-store the same yellow light as photographers prefer.

For artificial light there is none, obviously, that can compare with an electric system. This, however, is not always available, and in that case when either gas or oil is employed the lamps should be on the outside of the windows, through which their light plays into the inside of the house. Where electric, the plugs should be preferably 4ft. above the floor, on account of the danger of explosion from a plug-spark. For the same reason there should be no plug in the pit, if there be a pit.

Provision should also be made for the storage of rainwater, and racks, etc., provided for cushions, tyres, pumps, etc. A workshop has also to be provided.

The Public Garage.

Under this heading Mr. Townsend dealt with many types, both in this country and abroad, his remarks being illustrated by reference to the drawings exhibited around the room. In the main, he said, the principles applying to the private motor-house were equally applicable to the public garage. With many cars, or motor-omnibuses, going in and out, as clear a space as possible was necessary; so there should be few piers, columns or stanchions cutting up the floor space. A steel cantilever roof best served the needs, as at the London Motor Bus Company's garage, built by Messrs. Pierson and Co.; this has a length of 220ft. and a span of 115ft., without intermediate support. Most often, however, the site was one that made it necessary to design a building of several floors. A good example of such a building is the Winton Garage, New York (Mr. Charles A. Rich, architect), which has a roof space laid out for motor purposes. In London an instance of the use of flat roof space on similar lines can be seen at the Argyll Garage in Newman Street.

Discussion.

In proposing a vote of thanks to Mr. Townsend for his most interesting paper, Mr. M. G. Pechell said that, in the main, he agreed with the lecturer, especially as regards the length of lifts, which he thought were by no means extravagant, since, for instance, the new 6-cylinder Napier car was exactly 16ft. 1in. long, and other cars came pretty close. He thought, however, a longer pit might be of advantage, in case of accidents. In his own experience he had found, what Mr. Harrison had stated, that cement and concrete were unsuitable for flooring; he himself had recently used with great success a composition of which sawdust was probably a constituent.

Mr. Henry Tanner, jun., seconded the vote of thanks. With regard to inspection pits, he said that some years ago he designed a garage for a gentleman, the pit being 4ft. 6ins. wide; and recently the owner had altered this to 9ft. He advised that the pit should be several feet longer than the chassis in order to provide for the escape of the chauffeur in case of fire occurring whilst he was working beneath the car. For heating small garages he had found the Kane stove, an American invention, very useful; it was constructed on the principle of the Davy safety-lamp, with wire gauze protecting the flame.

Mr. Wonnacott and Mr. Cave also spoke.

Mr. Townsend, replying, said he did not see why a 9ft. pit should be better than one half the size, for in case of fire the chauffeur would still be unable to get out quickly, the cars being longer than the pit. He thought 40ft. a good space for a car to turn round in. With regard to turn-tables, he believed that if these were used more generally it would modify the designs of garages and produce probably more circular types.

Our Plate.

Palazzo Durazzo, Genoa: Entrance Stairs.

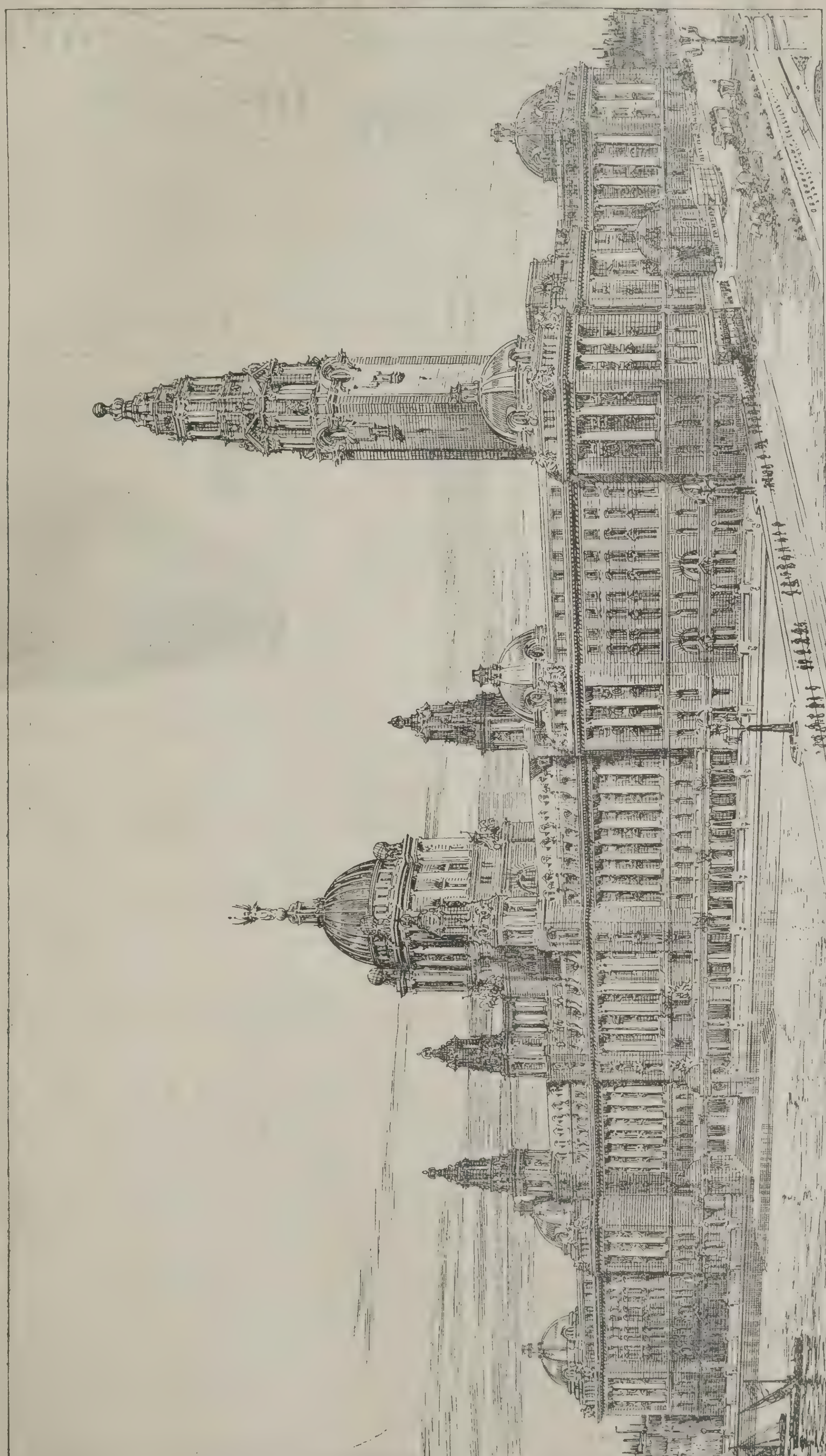
Together with the neighbouring university, this Palace in the possession of the Marchese Marcelle Durazzo is among the chief works of Bartolomeo Bianco (died 1056). The original design however was completely altered at the end of the eighteenth century by Tagliafico. In the original plan the entrance from the vestibule to the much higher, square courtyard was through two symmetrical stairways, with a lower common landing-place and a number of steps in front.

Through the alteration this entrance has been changed and has been replaced by a wide stair covering the whole width of the entrance (as illustrated). The steps of this splendid entrance being only a little in front of the first pair of columns, which support the arched vestibule, the view is less obstructed than was the case in the old plan; and the scheme as it now stands is a very fine one.

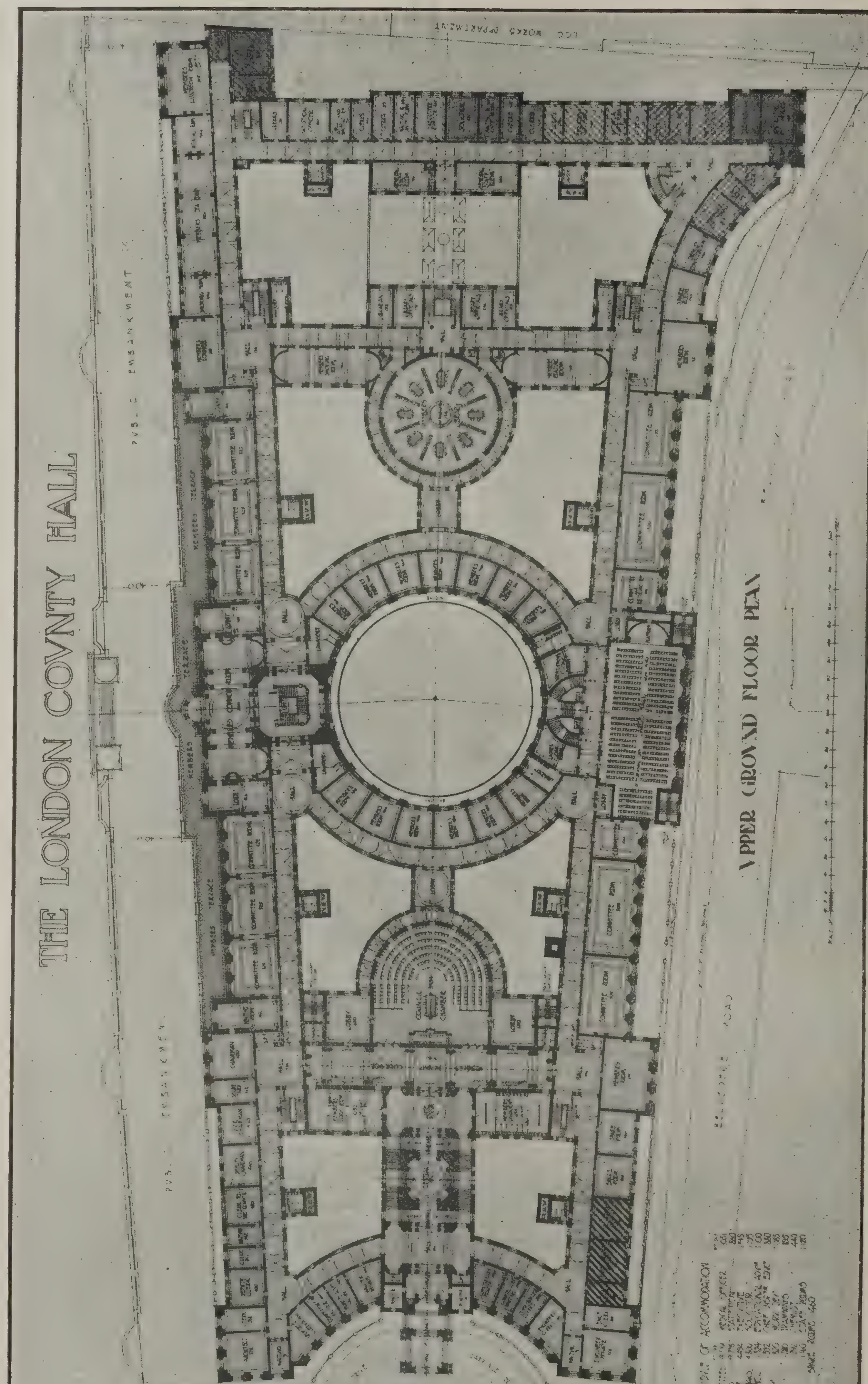
LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

Date of Delivery.	Competition.
Feb. 15	MUNICIPAL BUILDINGS AT SHANGHAI. — Conditions, together with site plan, may be seen at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.
Feb. 17	NEW COUNCIL OFFICES, &c., AT RADCLIFFE.—Limited to architects in Lancashire. Assessor, Mr. G. H. Willoughby, F.R.I.B.A. Premiums £75, £50, and £25. Conditions from S. Mills, clerk, Council Offices, Radcliffe, Manchester.
Feb. 26	REBUILDING OF EBENEZER CHAPEL, GORSEINON. — £5 5s. offered for best plan: intending competitors to state their charges "for making out specifications and bills of quantities." Cost of work not to exceed £2,000. Particulars from Rev. D. H. Thomas, Gorseinon.
Mar. 7	SECONDARY SCHOOL AT LOWESTOFT.—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft. Deposit, 5s.
Mar. 13	SCHOOL AT FISHPONDS, BRISTOL, for 600 children. Limited to Bristol architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.



LONDON COUNTY HALL. WARWICK AND HALL, AA.R.I.B.A., ARCHITECTS.



WARWICK AND HALL, AA.R.I.B.A., ARCHITECTS.

Correspondence.

The Municipal, Building, and Public Health Exhibition, 1908.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Our attention has been called to a letter from Mr. H. Greville Montgomery appearing in your issue of January 29th, to which we feel sure you will, with your usual kindness and impartiality, allow us to reply. In the first place, perhaps, you will kindly allow us to give the exact title of the Exhibition we are organising, namely, the Municipal, Building, and Public Health Exhibition. It will thus be seen that Mr. Montgomery is entirely in error in saying that "another exhibition on similar lines to that recently held by me at Olympia is being organised this year in London." As a matter of fact, this exhibition is the outcome of the recent admittedly-successful Gas, Electrical and Engineering Exhibitions we have had the privilege of organising, which have been largely attended by engineers connected with the various departments of municipal work, and the wish has been expressed from time to time that a thoroughly comprehensive exhibition might be held at which each of the different sections of municipal engineering might be illustrated, and all the latest and most approved appliances demonstrated. Naturally, building being so closely and intimately connected with municipal work, this word has been introduced into the title of the exhibition, and it is probably this which has caused Mr. Montgomery to view the project with alarm, because he is apprehensive that we may interfere with the success of the show which he proposes holding next year.

Mr. Montgomery goes on to say that "as several of your readers have already communicated with me on the assumption that I am responsible for this venture, I write to say that I have no connection with it in any shape or form." We can but express our surprise that any misunderstanding should exist as to who is responsible for the forthcoming exhibition, as our names appear very distinctly on all literature connected with the exhibition, and we venture to believe that our connection with various other exhibitions is sufficient to inspire confidence in the minds of those to whom the coming exhibition will appeal. Considering that this will be something like the 40th exhibition which has been organised by members of our firm, we are not altogether unknown—in fact, our reputation as exhibition organisers was established years before Mr. Montgomery entered into the business.

Mr. Montgomery says "the projected exhibition to which I refer has not even the merit of novelty, as it does not touch one single section of the trade not covered by my own exhibition." Again, we contend that Mr. Montgomery is wrong, for he has evidently overlooked the fact that whereas it is true that in his exhibition—through the enterprise of "The Surveyor," by the way—certain exhibits associated with municipal enterprise have been relegated to the gallery, this exhibition possesses the novelty of being the first in which municipal work forms the principal feature, and will occupy the premier ground-floor positions. It is too palpably evident that the entire purport of Mr. Montgomery's communication is to throw dust into the eyes of prospective exhibitors, and to endeavour to prevent space being taken at the Agricultural Hall, being aware of the fact that a considerable number of his former supporters at that place prefer it to Olympia. He is therefore naturally apprehensive that a show held at the former under efficient management may interfere with his receipts next year, but we cannot help expressing the opinion that in having made use of your editorial columns to give vent to his chagrin he has frustrated his object, as fair play is a virtue which is admired by all Britishers. Such tactics are not calculated to inspire confidence in those who do, or do not, support him in his enterprise, for in effect he says, "Mine is the only exhibition, and you ought to take part in no other display even though it bears but a faint resemblance to my own; you have no right to take advantage of other opportunities to extend your business." Yours truly,

SMITH & BRIDGES,
Organising Managers,
119-125, Finsbury Pavement, E.C.

Bournemouth Municipal Buildings.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—The leading article in your issue for January 29th is hardly correct, so far as this Association is concerned. You have evidently been misinformed. I shall be glad, therefore, if you can find room for this letter in your next issue.

When the architects were appointed in January, 1905, they were requested to bring in a scheme costing £70,000, but the scheme they laid before the Council in September, 1905, was estimated by them to cost £126,000 (or, with a dome, £135,000, I think). Naturally, we, as ratepayers, protested against this, and in June, 1906, the scheme was amended, being then estimated to cost £100,000, *exclusive of boundary walls and £3,000 for additional land.*

In August, 1906, my Association (which, I would mention in passing, you have mis-named) sent a protest to the Local Government Board, copy of which I enclose. We merely received an acknowledgment from the Board, but later, in writing to the Town Clerk refusing the Council's application for power to borrow the money for the extra land required, the secretary of the Local Government Board concluded his letter thus:—

"We have received a letter from the Bournemouth Residents' Association protesting against the sum to be expended as being excessive, and added that *prima facie* they thought the proposed expenditure was excessive."

This is all we have done, and we feel more than justified, for, as you say, the Council now invite plans for a scheme, and limit the cost to £80,000. (I would mention here that Mr. Mallows appears to have been paid £1,500 for his trouble, so he cannot have much to complain of.)

We know nothing about the etiquette of the profession, but you infer that we have been acting in conjunction with local architects; that is not so; we have not consulted them from first to last, nor have they us. Our action has been entirely on our own initiative, but I may add that it does seem to us only fair to the profession, and in the interest of the ratepayers, that such an important scheme should be thrown open.

Yours truly, ALF. J. TYLER.
Secretary, Bournemouth Residents' Association.

[*Copy of Letter.*]

To the President of the Local Government Board.

SIR,—In reference to the application you have before you from the Bournemouth Corporation for power to borrow £100,000 for the erection of municipal buildings, town hall, etc., I am requested by my Committee to bring the following to your notice:—

This Association at a meeting of its subscribers held in October, 1903, passed this resolution:—

"That in the opinion of this meeting it is desirable that the Corporation by an early date should provide a suitable town hall with courts for the administration of justice, offices for the transaction of municipal business, and other appropriate accommodation."

When this resolution was passed we had before us a report signed by the Town Clerk and Borough Accountant, just previously submitted to the Council, in which it was estimated that the cost of the new buildings, which were to include town hall, courts of justice, and free library, would be about £60,000, or £74,000 including cost of land (I enclose copy of that report).

In the scheme now submitted by the Corporation, which you will notice *does not include a free library*, the cost of the buildings alone is estimated at £100,000, to which must be added cost of land already purchased, £3,000 for additional land, and also cost of boundary walls, furniture, etc. It would appear, therefore, that the cost to the town is to be something between £120,000 and £130,000, or nearly double the estimate we had before us when our resolution was passed.

We do not wish to go to the length of opposing the Council's application to borrow, as we are fully alive to the necessity for new buildings, and the Corporation have our hearty support thus far, but we do wish very respectfully to make this formal protest against the amount proposed for such purposes. If I am correctly informed, similar towns—Eastbourne and Hastings, for instance—have all that is required in this way for an expenditure of £50,000. Surely £75,000 should provide all that is required for Bournemouth.

In considering the Council's application, my Committee respectfully ask you also to consider this formal protest against what would appear to be excessive expenditure, especially as it does not include provision for a free library, which has, I believe, been otherwise provided for.

Your obedient servant,
(Signed) C. R. ELWES,
Hon. Secretary.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—We notice in your issue of January 29th a leading article headed "An Architectural Injustice," and it is with a view to correct what we feel will give an erroneous impression that we bring before your notice, and that of your readers, further details of the above matter.

In the first place, we regret that the attitude of some local architects does not meet with the approval of the writer of your article. We are not aware that any architects have assisted the Bournemouth Residents' Association, but even if this were so, surely it would not be at all surprising when it is considered how they are being debarred by the municipality from having any opportunity of competing, together with the profession generally, for the various architectural works already carried out or contemplated in the immediate future, none of which can really be considered as coming within the duties of a borough engineer, such as:—

Municipal Buildings	£135,000
Technical Schools	25,000
Alma Road Elementary Schools ...	17,000
Boscombe and Westbourne Schools	5,000
Golf Pavilions, etc.	5,000
Kursaal	50,000

The sole exception to the above list is an absurd competition for a public library to cost merely £1,800.

It might unfairly be urged that the training and ability of the local architects is unequal to the accomplishment of the above works (and native modesty prevents our enlarging upon this most interesting theme), but even were that assumption correct, the question does not arise when their work is judged in open competition.

We hear other forms of municipal trading condemned on all sides, and it would be well, if architects would realise that their living is being taken away from them by the action of municipalities in allowing borough engineers, who already receive adequate salaries, to carry out architectural works; and is not the profession generally throughout the country justified in consistently advocating in a fair and professional manner that all such works should be put up to public competition on conditions arranged by the R.I.B.A.?

This is the most satisfactory means yet devised to secure the success of the most able design, as it gives young or comparatively unknown men an opportunity, as shown by the results of the Liverpool Cathedral and the London County Hall competitions. It secures the success of the best design, it removes all taint of favouritism, and it is calculated to obtain the most satisfactory result in the expenditure of public money. Were this course adopted, local architects would receive no advantage over their professional competitors; we feel that there is no good or sufficient reason for departing from this usual course, and that the results obtained up to the present amply justify our view.

With regard to the present competition for the municipal buildings here, what injustice can there be? When instructed to prepare sketch plans the borough engineer (F.R.I.B.A.) was desired to seek architectural assistance, and his suggestion of Mr. Mallows, F.R.I.B.A., as one with whom he was willing to work was sanctioned by the Town Council.

It is unnecessary here to express any opinion of the merits or demerits of the design. The architects were instructed to prepare a scheme at a cost very far below the estimate accompanying their design, which, as prepared and illustrated in the Journals, was estimated to cost £135,000, and this not inclusive of everything; and although the design was modified and brought down to a cost of £100,000, it must, in consequence, very materially differ from the one illustrated.

As this last-named sum is still felt, by the Corporation, and apparently by the Local Government Board, to be in excess of the requirements of a town of this size, are not the council entitled to exercise the rights of private clients, and abandon the scheme, especially when it is known that they have paid the not inconsiderable sum of £1,500 in settlement of the architect's claim, and we do not think the public will feel that such treatment is of a kind that would not be "tolerated in any other profession."

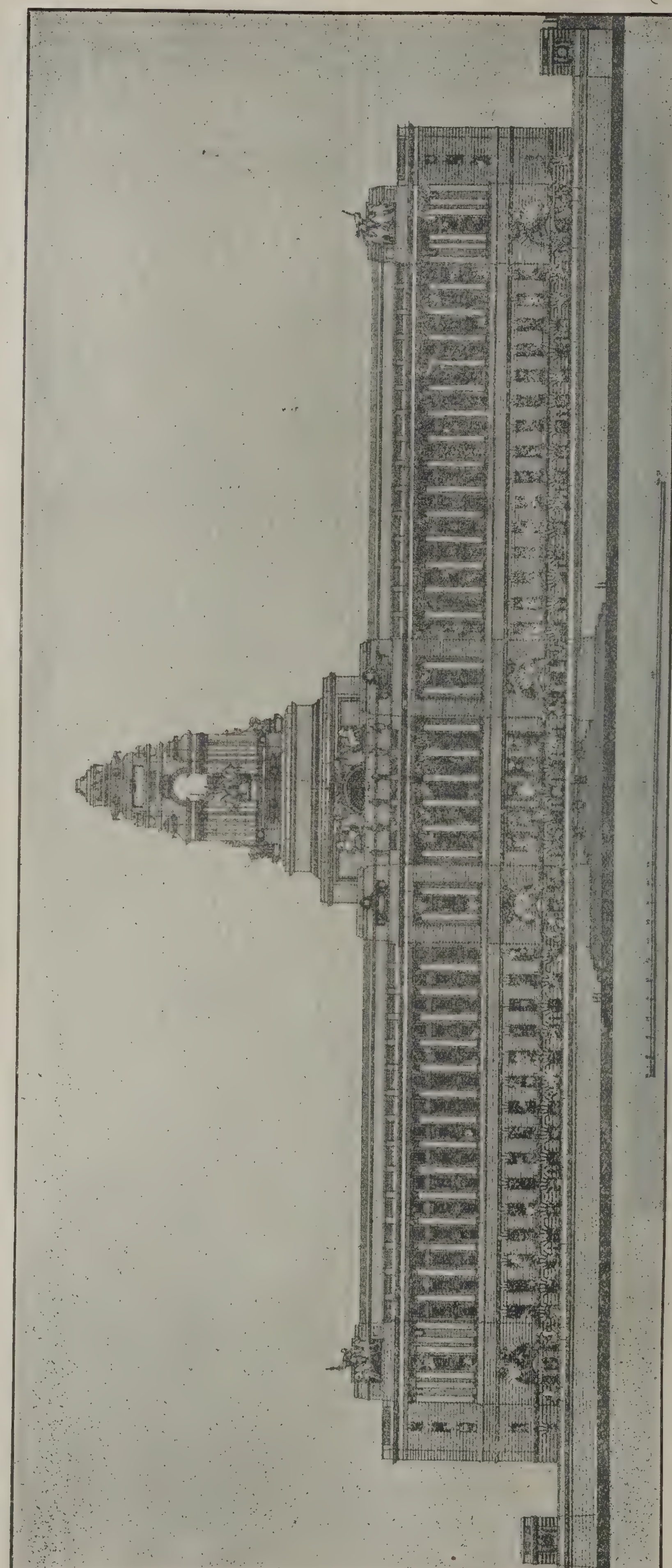
We believe that unless general practitioners are to be almost entirely excluded from public work, they must persistently keep the facts before the ratepayers, whose interests may not be best served by the employment of officials whose time is necessarily largely taken up with other official duties.

Yours truly,

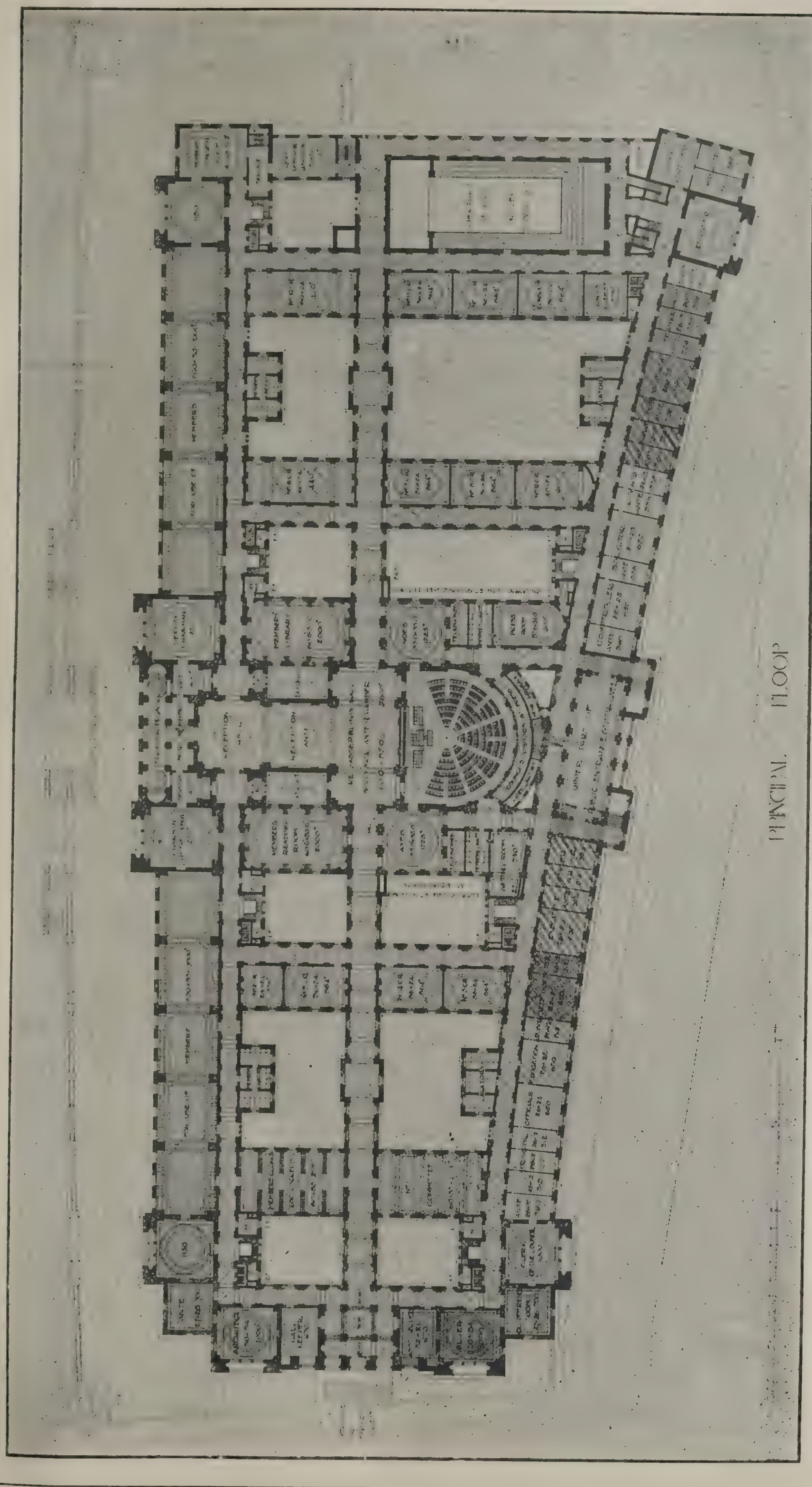
JOSEPH H. BREWERTON, F.R.I.B.A.
W. T. REYNOLDS.
SYDNEY TUGWELL.

Bournemouth.

[See leader in this issue.—ED., B.J.]



LONDON COUNTY HALL: ELEVATION TO RIVER. RUSSELL AND COOPER, FF.R.I.B.A., ARCHITECTS.



LONDON COUNTY HALL. RUSSELL AND COOPER, FF.R.I.B.A., ARCHITECTS.

Notes and News.

CONNEMARA MARBLE FOR NEW YORK.—Mr. Louis Mowbray, architect, of New York, and Mr. John Leahy, contractor, of New York, are now in this country in order to inspect the Connemara marble quarry at Recess, co. Galway, with a view to purchasing the entire output for use in America, principally in New York.

* * *

AN ASSOCIATION OF BRITISH BRUSHMAKERS has been formed as the outcome of the conference of master brushmakers which was held at the Great Eastern Hotel, Bishopsgate, E.C., on June 25th. The meeting at which the new Association was formally inaugurated was held at the Great Eastern Hotel, E.C., on January 22nd, and was attended by representatives of the principal brushmaking concerns in the United Kingdom. Mr. Ernest Kent (of G. B. Kent and Sons) has been elected president.

* * *

AN "EXCHANGE OF COMMERCE" is proposed to be erected on Kingsway, from designs by Mr. Robert J. Worley. It is primarily intended to provide a centre for business men from all parts of the country. There will be in the basement a large sample room and a safe deposit; on the ground floor the exchange itself (84ft. by 52ft.); on the first floor another exchange room, together with smoking-room, library, etc.; on the second floor a complete Masonic suite, club rooms, etc.; on the third floor a spacious smoking room; on the fourth and fifth floors 200 bedrooms, with bathrooms; and on the sixth floor the kitchen accommodation and servants' quarters.

* * *

THE CONSTRUCTION OF A GOTHIC VAULT.—A lecture on this subject was delivered by Mr. James S. Boyd before the last meeting of the Architectural Craftsmen's Society of the Glasgow Technical College. The lecturer, in introducing his subject, laid special emphasis on the necessity for the careful study of the construction of mediæval buildings as a means to obtaining the master-key to their constructive principles. After describing how the thrusts of the various vault ribs were collected and transmitted to the buttresses, the geometrical setting-out of the ribs was gone into in full detail. It was pointed out that while it was perfectly true that geometrical methods were employed by the Gothic builders, these methods were proved to be much more incomplete than present-day methods. The practical work of cutting the springer and boss stones was amply described and illustrated by numerous blackboard sketches, while photographs and large diagrams were exhibited to illustrate the constructive principles.

* * *

SOUTHWARK'S NEW LIBRARY.—The new library, on the "open access" system, which has just been completed and opened at the corner of the Old and New Kent Roads was erected by Messrs. F. and H. F. Higgs, of Loughborough Junction, from the designs and under the superintendence of Mr. Claude Batley, A.R.I.B.A., of 115, Gower Street, W.C. The style is Late Perpendicular Gothic, carried out in Portland stone. The principal features are the clock tower over the main entrance, and the corner staircase bay, with spaces provided for mosaic panels commemorating the connection of Shakespeare with this immediate neighbourhood (the committee have unfortunately not yet sufficient funds at their disposal to carry these out): above these panels is the "Chaucer window" in which the Canterbury pilgrims are represented as starting from the "Tabard" which stood only a few hundred yards from this spot. Other leaded windows commemorate Sir John Fastolf (a local worthy of the 15th century), Gower, Goldsmith, Dickens, Eliza Cook, Mrs. Coventry Patmore, Ruskin, Harvard, and Mr. Andrew Carnegie. Internally the joinery and furniture are of oak, left oiled so as to tone naturally with age. The first floor is to be devoted to the lending and reference departments, while the ground floor contains the public reading and magazine rooms.

* * *

A TOUR IN SEARCH OF COLOUR.—A paper on "A Tour in Spain and Italy," with special reference to study of colour, was read by Mr. H. Rutherford (Owen Jones student) before the last meeting of the Leeds and Yorkshire Architectural Society. Accompanied by an architectural friend, Mr. Rutherford went from London to Gibraltar, then across to Tangier, then back to Gibraltar, and so to Ronda; then on to Seville (where one of the chief attractions to a student of colour are the fine examples of coloured tile, brick and majolica work), and thence to Cordova and Granada. Returning to Gibraltar, Mr. Rutherford and his companion sailed to Palermo, in order to study the mosaics in the Capella Palatina. The interior is a perfect gem of mediæval art, the walls being entirely covered with glass mosaics on a golden ground. Their next stopping place was Pompeii. (In the wall decoration of Pompeii, marble is very rarely met with in the domestic architecture, and not often even in public buildings, the columns being invariably constructed of brick covered over with stucco, to which colour was applied, the scheme of colour decoration consisting mainly of reds, greens, yellow and black.) From Pompeii the tour was continued to Rome, Vienna, Florence, Venice, and terminated at Verona.

* * *

LIVERPOOL ARCHITECTURAL SOCIETY: DIAMOND JUBILEE DINNER.—The Diamond Jubilee of the Liverpool Architectural Society was celebrated by a dinner held on February 1st. The president, Mr. Edmund Kirby, F.R.I.B.A., occupied the chair. Among those present were Professor Reilly, Mr. Ernest George, Mr. R. Frank Atkinson, Mr. Paul Ogden, Dr. Edgar Browne, Mr. John M. Hay, Mr. W. E. Willink, and Mr. Thomas Shelmerdine (City Surveyor of Liverpool). Dr. Edgar Browne, in proposing the toast of the Society, said there was not the slightest doubt that a number of men who were united by a common idea, by an interchange of ideas, and by unification in their work, were able to do a good deal better than any scattered body of men could do. He would like to see, therefore, more corporate action on the part of architects. He did not think the architects had sufficient power in Liverpool; they laboured under the same disadvantage as the members of his own profession—they had not a sympathetic or appreciative audience to appeal to. Mr. Edmund Kirby, in response, traced the architectural advances which had been made in Liverpool during recent years. Mr. John M. Hay—the only survivor of the founders of the Society in 1848, and three times elected president—also replied. Mr. Paul Ogden, in response to the toast of "The Allied Societies," proposed by Mr. Hartley, said that many stately buildings now adorned Liverpool, being unsurpassed by anything of recent erection to be seen in London. Manchester was particularly envious of St. George's Hall, which he considered was the finest building in Europe. The toasts of "The University of Liverpool" and "The Chairman" were also acknowledged.

Trade and Craft.

A Useful Catalogue.

Mr. Robert Adams has just issued a new abridged catalogue, which contains a practically complete summary of the best productions of this well-known firm, namely, door springs (the "Victor"), fanlight openers and gearing, panic and other bolts, and a complete range of indispensable building appliances. It will interest our readers to know that the fine offices of the London, Edinburgh and Glasgow Assurance Co. in Euston Square (Professor Beresford Pite, F.R.I.B.A., architect) are fitted with the screwed rod and regulator system of ventilating gearing which is a leading speciality of this firm. The "Victor" spring hinges were chosen for the new War Office in Whitehall. A copy of the catalogue will be sent free on application to Mr. Robert Adams, 3 and 5, Emerald Street, W.

An Apparatus for Drying Newly-built and Freshly-Plastered Rooms.

Our readers are aware of the brazier system of drying houses, which is slow, chiefly by reason of the fact that the heat is not evenly distributed in the room in which the brazier is placed, and also because the scientific principles involved are not carefully applied. In the case of the "Turk" drying apparatus, which is being put on the market by Messrs. Setzer and Co., of Manchester, a special patent stove is placed in the centre of a room and consumes coke. A supply of cold air from the outside is conducted to the stove by means of a pipe, and the combustion of the coke produces a plentiful supply of evenly distributed carbonic acid gas in the whole chamber. The air is then conducted from the stove by means of an outlet pipe to the outside, and the room is completely dried, all the moisture being drawn out of the walls and ceiling alike in (at the most) two days, or, where rooms are small, in some cases in little over twenty-four hours. We have seen the apparatus at work in some houses in Manchester, where it has given every possible satisfaction; builders having arranged for successive blocks of houses to be dried by the same arrangement. The apparatus is not sold, Messrs. Setzer undertaking the whole drying arrangement in all cases. The saving in rent alone is very considerable; houses which would otherwise be standing empty for a considerable time while drying being now ready for occupation in two or three days from the commencement of the process. It is worthy of note that in Berlin, where the authorities do not allow a building to be used at all until six months after its completion, the authorities make special exceptions in all cases where buildings have been dried by the "Turk" system.

FIRE-RESISTING CONSTRUCTION SECTION.

(MONTHLY).

FIRES AND FIRE PROTECTION IN 1907.

Anyone reviewing the year 1907 from a fire point of view must express satisfaction, so far as Great Britain is concerned, with the comparatively small loss of property occasioned through fire. There has again been a decrease in the loss sustained throughout the kingdom, but particularly in the metropolis. The factors that have combined to attain this result are, in the first place, the fact that the policy of fire prevention is beginning to bear substantial fruit, both in building construction and in the general carefulness of the community; secondly, that the London Fire Brigade in its mobilisation and general work has reached a stage of efficiency almost perfect; and, thirdly, that the climatic conditions of the summer were such that they did not assist spontaneous combustion.

Regarding the policy of fire prevention in the metropolis, it appears to have been brought specially to bear on the better horizontal division of risks by floors, and the better equipment of door and window openings with steel roller shutters, heavy party-wall doors, hardwood smoke doors, etc., and the application of fire-resisting glazing in metal or hardwood casements.

That there should be such a substantial decrease in the fire loss of London is the more remarkable if we consider the quantity of highly inflammable spirit to be found within our county limits, due mainly to the increasing use of motor cars. The quantity of petrol used in any one square mile north of the river, particularly in the Holborn, Long Acre and certain West-end districts, is enormous, and no matter what the regulations are, or what care may be taken as to inspection, there cannot be the least doubt that a far greater quantity of petrol is in store, on the aggregate, than is permissible, and that motor car manufacturers, and garage proprietors in particular, seem to glory almost in the manner in which certain of the regulations are evaded.

The reduction of the loss is also remarkable if we consider the increasing amount of celluloid to be found in London. This highly inflammable material is being more and more used, despite all warnings, and we find it in dangerous quantities in numerous classes of buildings. Not only is celluloid the most seriously dangerous material when alight, but the fumes thrown off by it prevent active fire-brigade work, and for this reason alone it is a most hazardous commodity so far as loss of property is concerned.

Fires during 1907.

With regard to fires generally throughout Great Britain, we would mention first some in connection with the motor industry.

There was a loss of about £10,000 at the Vulcan Foundry; one of about £18,000 at "Hobbies'" Works, East Dereham; one of £20,000 at Hetherington's works, Ancoats; and quite a number of smaller fires of this character.

Next come the usual fires in dye and print works. The Alexandria works, Dumbartonshire, meant a loss of £30,000; Gartside's works, Stalybridge, £25,000; Holcombe Brook works, Ramsbottom, £23,000; and the Abbey Print works, Whalley, £10,000. The Bradford Dyers also had a fire at their Water Lane dye works involving a loss of £45,000; and Messrs. Eastman and Son had a fire involving £20,000 at their Acton works, near London.

As regards fires in theatres, music-halls, etc., the most notable of the year was one at the Rhyl Palace, and there was another at the Newcastle Olympia; both fortunately without loss of life. There have also been quite a number of small fires of this class, including some due to cinematograph shows.

Of London warehouse fires, one in Wood Street and one in Featherstone Street occurred which meant a loss of about £50,000 in each case. All the other warehouse fires in London were comparatively small. A notable shop fire was the one at Messrs. Gamage's, but its extent was much exaggerated, the actual loss being very moderate.

Of paper mill fires, that which occurred at Sittingbourne—Lloyd's paper mill—was a notable one, causing about £18,000 damage.

Among brewery fires, that which occurred at the Brighton Malting works meant a loss of £30,000.

Reverting to the question of spinning mills, there were numerous fires caused, but the losses in each case were moderate, all, excepting one, being under £10,000; the exception was a fire at the mill belonging to the Hathershaw Spinning Works at Oldham, which resulted in a loss of £40,000—a matter of some surprise, as the building was supposed to be a fairly good one.

Government buildings at home have been moderately free of fires, the chief one being that of the Gun Wharf at Portsmouth, involving a loss (it is said) of about £150,000; and as Government property is uninsured, this was a dead loss to the National Exchequer.

As regards municipal buildings, quite an extraordinary number of fires broke out in schools, though the losses in every case were of no great consequence.

"Fire Protection" in the Future.

As to the future, it is pleasant to observe that the "Post Magazine," from which we have taken the above figures, states that "there are, perhaps, few subjects to the importance of which fire managers of insurance companies are more keenly alive than to efficient 'fire protection' of buildings." If true, this would mean more for fire prevention than any amount of special effort, and the propaganda of the past would have thus borne fruit where most necessary. But this statement of our valued contemporary is a bold one to make after the many years in which the orthodox insurance official used only to "take risks as he found them," and did not care a straw about good construction or "fire protection." Our contemporary is, perhaps, quite right in its statement, so far as the younger generation of fire managers is concerned, but we know many eminently estimable managers and branch managers of the old school who still have the old views that "fire protection" is not worth troubling about, and until these have been superseded by younger and more intelligent men, we suspect our contemporary's wish is father to the thought. Of course, it would pay most of the Fire Offices to pension those who still enjoyed the older views. But we are afraid this is not to be.

It speaks well, however, for the change of tone in this direction that London is at last the possessor of an Insurance Institute, for last year one was founded with a membership of over 1,000, and there cannot be the slightest doubt that this Institute will influence "fire prevention" in the best sense, and will add to the general education and knowledge of its younger members. There have, of course, long been fire insurance institutes in several of our provincial centres, and the papers of the Federation of Insurance Institutes have done much good to London, which is so greatly behind in these matters. The founding of an Institute for London, however, is an advance that should have far-reaching effect.

The "Post Magazine" states that there is still much to be learnt, and probably much to simplify, in respect to the various mechanical appliances claiming to prevent fire, now on the market, but, after being subjected to some distrust, the belief in their efficiency is now rapidly gaining ground. Our contemporary has more in mind the appliances of the "sprinkler" and "drencher" type, or the automatic fire-alarms, rather than what we might term the constructional appliances or equipment, but the observation holds good in both cases, for there is no doubt that complication in construction and equipment may be avoided and that simple construction on direct lines and simple appliances achieve the best results.

New Rules and Regulations.

New rules and regulations that came into force during the past year were those embodied in the London Building Amendment Act, but little has been done in respect to them, owing to a somewhat half-hearted policy on the part of the London County Council which the "wicked world" attributes to political acumen.

On the 1st of January, 1908, the Railways Act regarding fires came into force, also a short Act as to the responsibility of chief officers of fire brigades.

Another matter is the adoption by the Fire Offices of electric-lighting rules. It would indeed be well if there were absolute uniformity amongst all the Fire Offices and the Institution of Electrical Engineers. At present some offices are walking their own road, much to the annoyance of architects and electrical engineers who have to meet the conflicting requirements.

The London Fire Brigade and the Salvage Corps.

We have mentioned that the work of the London Fire Brigade has been eminently satisfactory during the past year: we would again emphasise that its scheme

of mobilisation is second to none. As in previous years, new fire stations have been opened during the past year; in particular one at Cannon Street, and the Salvage Corps has been equipped with a thoroughly up-to-date fire station at Watling Street.

Foreign Fires.

These concern us but little, except where they are of a character instructive to us.

America has had its usual array of large fires, but none of them taught anything particularly new.

Jamaica and Valparaiso have had combined earthquakes and fires, but these, again, do not teach us anything that we had not learnt from the San Francisco conflagration.

Of our Colonies, New Zealand seems to have been the chief sufferer, the Houses of Parliament at Auckland, and some large warehouses at Christchurch, having been burnt down a short time ago.

Insurance Rates.

In the matter of insurance rates, the ordinary householder insurer does not seem to have benefited so much as he should have done, but with the creation of non-tariff Offices, and the fact that there may shortly be an organisation to systematically move for the reduction of insurance rates, some improvement may be anticipated even in this direction.

FIRE AT LANCASTER.

The Athenæum Theatre at Lancaster, which was almost entirely destroyed on February 1st, was one of the oldest theatres in the provinces. The fire broke out in the scenery and dressing-room. The roof fell in, but the outer walls remained intact. The accompanying photograph speaks for itself. The damage done is estimated at £6,000, this sum being partially covered by insurance.

HIGH-PRESSURE HEATING APPARATUS AND WOODWORK.

Having received from a correspondent an enquiry in regard to the church fire which occurred recently at Filey, we here publish it together with a reply by a specialist's contribution, as the matter is of much general interest.

The enquiry and reply are as follows:

"In reference to the above, I should be glad to have expert advice on the following points, or a book that would elucidate them, namely:—

"(1) Can water, under sufficient pressure (what pressure) be made hot enough to ignite dry wood in contact with the containing pipe?

"(2) If so, what temperature would be necessary?

"(3) What temperature would cause the spalling of the common bricks and freestone composing a flue?

"I may say that the origin of the Filey Church fire is the subject of much controversy in the town. The churchwardens, who are responsible for the installation of a high-pressure heating apparatus with ⅞in. circulating pipes that 'expanded' to about 2ins. in the furnace (stoker inexperienced), maintain the impossibility of heating water high enough to ignite wood. I, as a steam-engineer, know that it will; but to many people water, as a conductor of fiery heat, seems a preposterous idea; hence there may be a repetition of danger, and to minimise this I should welcome an authoritative opinion from you on the three questions submitted, or a book."

Reply—

Water at the pressure of the atmosphere, say 15 lbs. per sq. in., can be heated up to 212 degs. Fahr. Under pressure, as in high-pressure hot-water pipes, the temperature may be dangerously increased. At a pressure of 300 lbs., the temperature of steam is about 420 degs. Fahr.: water under this pressure is probably much greater.

The danger from high-pressure hot-water pipes in contact with or near woodwork arises not only from possible high temperature, but from the repeated heating and cooling of the wood, by which it will eventually absorb oxygen rapidly as to raise the temperature sufficiently to cause spontaneous ignition.

To guard against this danger, the London Building Act requires steam and high-pressure hot-water pipes to be kept 3ins. from combustible material, and the by-laws of many local authorities contain similar regulations.

The temperature at which the surface of bricks and stone will split off varies considerably. A dense pressed brick will split under a sudden rise of temperature equal to about 500 degs. Fahr., chiefly due to irregular expansion. A London stock will stand a temperature of more than 2,000 degs. Fahr.

Useful books on the subject are:—"Fire: Its Prevention and Extinction," by John S. Braidwood (published by Pillans and Wilson, Edinburgh); "The Chemistry of Fire and Fire Prevention" (Ingle and Ingles); "Fire, Fire Risks, and Fire Extinction" (Society of Arts Cantor Lecture), by Prof. Vivian B. Lewes.

Photo: Simpson.

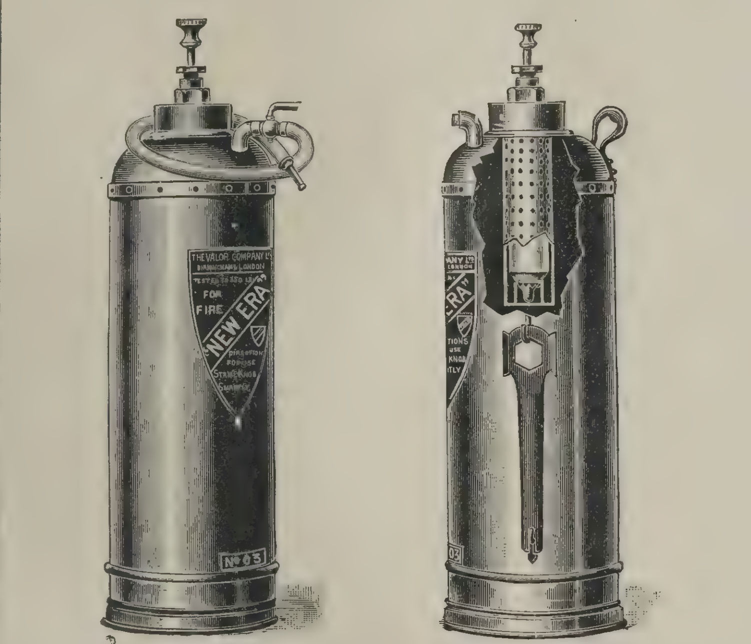
FIRE AT THE ATHENÆUM THEATRE, LANCASTER, FEBRUARY 1st, 1908: VIEW FROM CIRCLE

"NEW ERA" FIRE EXTINGUISHERS.

Report No. 124 of the British Fire Prevention Committee deals with the Valor Co's extinguisher tests.

The following preamble in regard to the "New Era" fire extinguisher tests is interesting reading, especially to those who anticipate special results with extinguishers where petrol gets alight. Mr. Percy Collins, J.P., member of the Testing Sub-Committee in question, writes as follows:—

"The series of tests with the 'New Era' chemical fire extinguisher again showed that hand chemical fire extinguishers, as a class, can often be employed with advantage in the incipient stages of small fires. If a small fire has obtained such proportions that it cannot be extinguished, a chemical fire extinguisher might still keep it in check until larger appliances can be brought into play—this applies especially to loose material.



THE "NEW ERA" FIRE EXTINGUISHER.

"The various tests undertaken with petrol would point to the conclusion that, with a volatile liquid, giving off such an inflammable vapour as this does, the extinguisher may be of use in putting out the fire, but only when under confined conditions. It was in effect proved to be so when handled with skill, and when the exposed surface of the petrol was not more than 2 super. ft., or when the side of the vessel was slanting, so as to enable the liquid and gas from the extinguisher in the one case to form a curtain and stop combustion, and in the other case to be directed down the slant and thus lift the flames from the liquid as the operator progressed with it along the surface.

"Chemical first-aid appliances should be examined and tested periodically, and care should be taken that the hole of the nozzle is always kept clear."

Objects of Tests.

The objects of tests on this occasion may be shortly described as follows:—

To ascertain the effect of the application of "New Era" fire extinguisher (supplied by the testor) upon various burning materials both in a room and in the open.

The tests comprised tests ordered by the Committee, "demonstration" tests undertaken at the request of the testor, and supplementary tests ordered by the Committee. The tests were in certain instances followed by re-tests, ordered by the Committee.

Summary of the Tests.

The following is the official summary of the results of the tests ordered by the Committee:—

The tests demonstrated that the extinguishers brought into action were uniformly efficient in checking small fires in their early stages, whether applied by parties inexperienced in their use or by parties having expert knowledge of their application (*i.e.*, by nominees of the Committee or nominees of the testor).

In several instances one appliance more than sufficed to completely extinguish small fires.

When the material ignited was soft and loose, some difficulty was apparent in stopping the smouldering which ensued; the flames, however, were kept in check and nearly extinguished.

Petrol fires were extinguished when the area of the spirit did not exceed that covered by the spray of the extinguisher, or in elongated vessels of limited width when the spray could be skilfully directed so as to lift the flames from the liquid as the operator progressed with it along the surface.

B.F.P.C. TESTS.

The British Fire Prevention Committee's tests of last week again dealt with fire extinguishers, a subject that has gained considerable importance of late, as architects and engineers are being constantly requested to specify extinguishers in connection with the fire appliance installations in public or semi-public buildings, and in buildings of the warehouse and factory class.

The type of extinguisher under test on Thursday last was an American one known by the trade name of "The Accurate," and might be described as an adaptation of the American "Underwriters'" extinguisher.

The tests were carried out under the usual conditions, and the full report will be issued in due course.

The attendance at the tests was considerable. The sub-committee in charge of the tests comprised Mr. Percy Collins, J.P., as directing member, Mr. Ellis Marsland, Mr. James Sheppard, A.I.E.E., Mr. Horace Folker (vice-president, N.F.B.U.), and Chief Officer R. W. Henderson.

The total series of tests comprised 12, part indoor and part outdoor, with a certain number of re-tests.

Another type of extinguisher will again be under test towards the end of the month, after which a series of floor tests will again be undertaken.

FIREPROOF CONSTRUCTION IN THE STATES.*

By M. M. Sloan, Architectural Engineer.

The question has been debated as to whether the term "fireproof" is not a misnomer, and whether "fire-resisting" is not more applicable to this type of modern construction. While such arguments about mere nomenclature have little bearing upon practical results and the development of non-combustible buildings, yet it has been made the subject of discussion among engineering and insurance societies and associations, and it was decided by the Fire Protection Congress in London in 1903 that the term "fire-resisting" was better applicable for general use, and that this term more correctly described the varying qualities of different materials and systems of construction intended to resist the effect of fire for shorter or longer periods, at high or low temperatures.

Undoubtedly the term "fireproof construction" has become discredited in the lay mind from the fact that it has been the custom of hotel, apartment-house, and theatre managements to advertise buildings of a more or less uncertain construction as being entirely fireproof; and then, too, the newspaper reviews and accounts of great conflagrations have not allayed the popular suspicion regarding the fallacy of this term. This is not to be wondered at when it is considered that in these articles and reports no differentiation has been made regarding the exposure and conditions to which the structures were subjected, nor to the quality of their fireproofing and its design.

There does, however, appear to be

a Distinction between "Fire-proofing" and "Fire-resisting."

It would seem that the former is more limited in its scope than the latter, from the fact that the former implies the constructional use of materials which will prevent destruction by fire; while the latter would seemingly include not only features of construction, but, as well, those installations intended to combat fire within the building, or conflagrations from the exterior.

In this article, therefore, the treatment of the subject will be based upon fireproof construction rather than upon the many modern features entering into the equipment necessary for the successful resistance of fire.

It is only by the use of modern fireproof construction that the tall buildings of the present day are possible; they would be entirely impracticable if they were not fireproof, from the fact that the risk would be so great as to cause them to be uninsurable, and consequently non-

*From the "Architects' and Builders' Magazine.

commercial. In most of the large cities fireproof construction is more or less compulsory, for, while the city ordinances will permit buildings of joist and slow-burning construction, they do restrict the size of such buildings in such a way as to make it practically impossible to build buildings of great area other than fireproof. Such ordinances are wise provisions, as they tend to prevent great fires and conflagrations, by causing all modern structures of any size to be planned upon fireproof lines.

To explain this more fully, the city of Philadelphia classifies buildings under three headings, namely, first, second and third class. To buildings of the first-class is permissible a floor area as great as 15,000 sq. ft. without division walls, while only 10,000 sq. ft. is allowed for buildings of the second class, and only 5,000 sq. ft. for buildings of the third-class, which includes joist construction.

Fireproof construction, therefore, besides being required by laws and ordinances, materially reduces the insurance rate—frequently to such an extent as to make unprofitable any other kind of a building than one of a first-class fireproof construction. There is, probably,

no Worse Type of Building to Resist Fire

than the steel frame building without protection for the steel members. In one and two-storey buildings of this type of construction complete wrecks of twisted steel have been made fifteen minutes after the fire started, showing how little unprotected steel can withstand the heat. Cast-iron stands little better than structural steel; besides, the general impression is that cast-iron columns are broken and shattered by the sudden application of water when greatly heated. This fact, however, is hardly substantiated, as in numerous fires cast-iron columns have withstood the heat better than the structural steel beams or girders which they supported.

The Lessons of Great Fires.

Fireproof construction, as with all the applied arts and sciences, is, as it stands to-day, the development of fifteen or twenty years' experience; and in no other art or science can so little be gained from philosophy, and so much from experience and the lessons taught by the careful study of the results of great fires.

The requirements for fireproof construction are well set forth in the reports of the experts of the U.S. Geological Survey concerning the conflagrations at Baltimore and San Francisco, and the final conclusions which are derived by them are as follows:—

"(a) Roofs, roof appurtenances and skylights should be given ample protection against fires from without.

"(b) A great excess of fire hose and apparatus beyond ordinary needs should be available.

"(c) Strong bond for fireproofing tiling, etc., both for girder and column protection, is essential.

"(d) Protection for front windows, as well as for side and rear ones, is of vital importance.

"(e) Good protection for steel frames and steel roof trusses in attics or the exposed or unusual places should be provided.

"(f) Liberal use should be made of fire-retardant in windows and door transoms.

"(g) Wise and liberal use of concrete and reinforced concrete for girder and column fireproofing has proved its saving quality.

"(h) Interior fire protection and prevention by wells, pumps, sprinklers and water tanks vastly lessen fire risk."

Protection of Steelwork.

It is certain from the above conclusions that in any fireproof building the enclosing or division walls which rest upon or are supported by iron or steel girders and columns must have their bearing and sustaining members ensured against a diminution of strength due to fire by having these members adequately protected. Such protection may consist of brick, terra-cotta, fireclay, concrete, or other approved fireproofing, but in all cases the fireproofing must be such as has successfully withstood severe tests, either made experimentally or actually experienced in a conflagration.

Most of the large cities outline in their building laws the requirements for fireproof structures, and the fulfilment of these requirements results in buildings of the first-class having the privileges granted this superior type of construction. It is generally required that the fireproofing around outside columns and beams, if of brick, shall not be less than 8ins. or 9ins., and if of hollow tile the protection shall not be less than 6ins. Generally, where exterior steel beams or heavy girders are used, it is necessary to provide at least two sets of air-spaces between the iron and steel members and the outside of the hollow-tile covering. With reinforced concrete construction the thickness of the protection for the steelwork embedded therein varies from 3ins. for columns and the flanges of beams and girders to 2ins. of protection on the sides of members subjected to transverse stress.

In all instances the iron or steel members of the floor systems must be adequately fireproofed, and the materials and constructions used in the floor systems must be those approved by the department. So rigid are the requirements of the principal cities that no new system of construction is accepted as fireproof unless the same has been subjected to rigid fire and load tests, conducted in a scientific manner under the supervision of the building bureau.

Selection of Fireproofing.

One of the greatest difficulties encountered by the designer of fireproof structures exists in the selection of the fireproofing material and the system of fireproofing construction to be employed. There is much contradictory matter written which seems to condemn all of the types of modern construction, and magazines prejudiced against one type of construction will publish articles showing failures and deficiencies of this type, while other publications give the strongest support to the criticised type, and make out a most excellent case for its adoption. The circular matter produced by those interested in the different forms of fireproof construction does not tend to assist in the selection of the type. Experience, however, shows that nearly all forms of modern fireproof construction have their particular use, and are better suited than other forms for certain characteristic constructions.

The available materials for the fireproofing of exterior columns consist of brick, ornamental terra-cotta, or concrete. For floor constructions of high buildings, where only the steel skeleton frame can be employed, and where loads upon the floor systems are light, there is probably no more economical material, or one better adapted to the work, than the hollow tile construction now commonly employed. For buildings of ten storeys in height, and used for manufacturing or warehouse purposes, where the floor loads are heavy, concrete lends itself admirably to the purpose, and this material is also of use in fireproofing independent steel beams, lintels and girders in buildings where but few of these members occur.

A review of the last two great fires shows that fireproofing either of brick, terra-cotta tile, concrete, or metallic lath and cement are good fireproofing materials when properly applied and constructed. From these fires the fact was made plain that in order to have a highly fireproof material, not only must the material be right, but the method of applying it and the workmanship must be the best available.

The lessons taught by the great Baltimore fire are summed up as follows:—

1. *Protect all openings against exterior attack.*

Special attention should be given to all openings and materials and devices provided that offer adequate resistance to exterior fires. The solution of the problem seems to be in metal or metal-covered window frames, sash and shutters, and wire glazing.

2. *Common brick is the best material for exterior walls.*

Common brick withstood the fire and heat better than any other material. The spalling and scaling off of all varieties of stone and terra-cotta would indicate that these are undesirable for exterior work, and that a new and more refractory material is needed for exterior ornamentation.

3. *Avoid stone bases, columns and caps.*

The destruction by spalling of stone columns, bases and caps demonstrated that stone is unsafe for this purpose in places where it is liable to be attacked by fire or where there are violent changes in temperature.

4. *Select a strong efficient floor construction.*

A strong efficient floor, capable of sustaining safes, should be selected. If brittle material must be used for arches, the top surface should in all cases be protected with at least 3ins. of rich concrete. A suitable test to specify is a strong box filled with crushed stone or sand, weighing 500 lbs., dropped from a height of 3ft., so that one corner of the box strikes the floor. Safes should never be mounted on skids. The floor construction should have sufficient strength to support them, with small steel plates under the wheels, if necessary, to avoid crushing the floor finish.

5. *Pipes inside of the column protection are objectionable.*

The pernicious custom of carrying pipe lines adjacent to and parallel with the columns without doubt caused the destruction of much of the column protection, and the consequent injury to the few. In addition to this, the pipes often admit moisture and air to the columns and thus favour oxidation.

6. *Metal treads should be provided in all stairways.*

In many cases the marble and slate treads of stairways were totally destroyed, leaving only the open frames in position. If metal treads are provided underneath the wearing surfaces the stairways will remain serviceable as long as the frames endure.

7. *Provide for expansion of lintels and mullions.*

Space should be left at one or both ends of these metal members to allow for expansion, and avoid damage to adjoining masonry of finish.

8. *The steel members supporting walls should be carefully protected.*

In many cases the wall girders were left exposed, or improperly protected over the window openings. The burning of the window frames heated these girders until they bulged and damaged the walls.

9. *Face brick and all veneering should be bonded with the backing.*

Metal anchors and ties for securing face brick proved insufficient and should be avoided in good practice.

10. *Hollow tile floor blocks should not be cut to support marble or other finish.*

The practice of cutting holes in the under side of floor blocks to anchor materials of finish not only weakens the anchors, but in case of fire hastens the destruction of the blocks.

11. *Buildings over 100 ft. high should be equipped with stand pipes.*

Hose connections should be provided on every floor. A complete auxiliary fire extinguishing apparatus would also be advantageous.

For fireproof construction to be efficient it must be uniform in its resisting qualities throughout the structure which it protects. It is almost as bad for the fireproofing to be deficient in a single portion as it is to have a framed structure with a weak member or connection. It is not inconsistent, however, to fireproof structural members according to their importance, as, for instance, it would seem logical and reasonable to fireproof the main columns of a building, which support many floors and upon which the entire stability of the building depends, in a more efficient manner, and beyond the possibility of their becoming damaged by fire, their buckling and consequent failure.

Fireproofing of Secondary Members.

Important girders which carry several floor systems and support walls or other structural masonry should have as much care bestowed upon the design of their fireproofing as columns. Where, however, commercial expenditure demands it, the fireproofing of the secondary members of the floor systems, such as light beams and other features of construction, need not be so efficient and secure as around the heavier members.

It is evident that if the fireproof construction is carried out along these lines the structural costly portions of the building will be saved in case of a severe conflagration, and a minimum damage will result from any fire. It is a comparatively simple matter to restore secondary members of floor systems where the same have been bent beyond the possibility of use, but where important columns are badly buckled, the floor levels of the building are destroyed and the matter of restoring these members becomes a difficult and expensive operation.

Dangers of Internal Piping.

Frequently an ordinary good fireproof construction is made inefficient by the practice of running heavy pipe lines and other ironwork within the fireproofing. By the expansion and buckling of these the fireproofing is disrupted and the structural members exposed. From this it is evident that fireproofing materials must not only be incapable of destruction by fire, but they must have sufficient structural stability to resist the force of heavy streams of water and the shock of falling construction, while fireproof walls and partitions must have sufficient resistance to withstand the pressure or rush of air exerted upon them by the expansion of the air confined in the room which they enclose.

Another quality to be possessed by an ideal fireproof material is that it shall be a non-conductor of heat, and those materials seem to fulfil this requirement best which are most porous in nature. Porous terra-cotta and cinder concrete have in many instances shown their superiority over denser materials for the protection of structural steelwork.

One of the severest actions upon fireproofing materials is caused by the rapid rise in temperature from the air and the equally rapid cooling from the water, producing sudden expansion and contraction of the materials. Where the fireproofing consists of units held together by cement mortar there is a possibility of the mortar bond being broken from these causes so as to allow the fireproofing to be destroyed. Fireproofing may also be thrown from the members which it protects by water or moisture getting at the back of the protection, expanding suddenly to steam by the heat, and thus throwing or bursting the protection.

AUTOMATIC FIRE-ALARM INSTALLATIONS.

Rules of the Fire Offices' Committee.

We give below in full the rules of the Fire Offices' Committee for automatic fire alarm installations. These rules are of importance to architects who have to arrange for such fire alarms, and the following will be found useful for reference :

GENERAL.

1. Every automatic fire alarm must be connected either directly or through an approved substation with a public fire station having steam equipment and permanent staff, except as next provided.

2. When connection with a public fire station is not allowed the connection may be made with an approved central fire alarm depot.

3. Such central depot, unless in immediate proximity to the fire station, must have two separate and independent means of communication therewith, such as, for example, a direct private telegraph or telephone line and a public exchange connection or two independent private lines, in either case having separate instruments and accessories.

PROTECTION AND SPACING.

4. Thermostats must be spaced as prescribed with regard to each type of approved thermostat.

5. Every portion of the building and of all buildings communicating therewith otherwise than by double fireproof doors, must be protected.

6. A thermostat must be suitably fixed in each storey not more than 5 ft. distant from well lights, and from areas, hoists, elevators and/or staircases which are not enclosed by walls of brick or stone construction having all openings therein protected by doors.

7. Rooms divided into sections by walls, partitions, or storage racks reaching within 12 in. of the ceiling must have each section protected.

8. Except in the case of shop windows a clear space of at least 2 ft. must be preserved below every thermostat, and no goods must be placed within 2 ft. of thermostats in any direction.

APPARATUS.

9. A weather-proof electric bell with gong not less than 6 in. in ditmeter shall be located on the outside of each risk equipped, placed directly over or as near as possible to the annunciator.

N.B.—In expansion pneumatic installations, if in addition to the electrical alarm a water motor gong is provided, the same should not be less than 6 in. in diameter, and should be fixed outside the building, suitably protected; it should give the fire alarm when the air pressure falls to 10 lbs. per square inch. The motor feed pipe should be at least one inch in diameter, should be coupled to the town supply and have a stop tap secured open by a padlocked chain.

10. There must be an annunciator having an indicator for each storey or section of storey, separated by a party wall, located in an accessible place where it can be readily seen by firemen responding to an alarm.

11. Transmitters must be located near the testing apparatus and be enclosed in a dust-proof case securely locked. They must give a continuously audible warning when not in a position for transmitting the full fire call. Any clockwork must be wound from the outside of the case.

12. Electric bells must be of the trembling pattern (not single stroke) and the system must be so arranged that the failure of any one bell can in no way interfere with the proper giving of alarm at other points.

13. Thermostats, transmitters, testing boxes, and annunciators must be so constructed and placed that vibration or shock cannot start their mechanism.

14. All switches, plugs or communicating devices must be so arranged that they cannot be left in a position which would render any portion of the mechanism inoperative without giving a visible and continuously audible warning.

15. All circuit closers must have contact surfaces of non-corrosive metal.

16. Relays must be located in a dust-proof case and must have a knife-edge spring contact point in addition to the ordinary relay contact.

17. All indicators, relays, transmitters, bells, and other appliances must be of substantial construction and of a quality and finish at least equal to the standard which obtains in the British Post Office. Every detail of each installation shall be constructed of materials of the best quality of their respective kinds, and shall be made and erected by experienced workmen under qualified supervision.

SOURCES OF CURRENT.

18. A sufficient supply of current must be automatically available at all times.

19. A stand-by battery or batteries, or the parts thereof, capable of replacing any other battery or generator in service must be kept in readiness.

20. Batteries must be kept in a cool dry place protected from frost, and must be enclosed to prevent mechanical injury, but be readily accessible for inspection.

ELECTRICAL CONDUCTORS.

21. Indoor wiring must conform to the following specification :—

(a) Conductors must be of pure copper of not less than No. 20 S.W.G. insulated with pure and vulcanised india-rubber of a quality not less than 300 megohm grade, and taped, braided and compounded.

(b) These conductors must, in wet places and through fire-proof partitions, be enclosed in enamelled screwed conduits, and in dry places in metal conduits or in wood casing. All conduits must be fitted with a proper insulating bushing at each open end, and with the other standard accessories intended by the makers.

(c) No staples, nails, or other metal fastenings may be used to support conductors.

(d) Loop wiring shall be used as far as is practicable. Joints should be avoided, but when necessary must be in dry places only and must be made by a competent jointer, resin soldered, and with proper rubber insulation, and over all protective taping.

(e) Each newly completed installation when tested with not less than 100 volts must have an insulation resistance of at least one megohm to earth and at least 20 megohms divided by the number of thermostats across poles. Should any test under Rule 34 show an insulation resistance to earth lower than 0.3 megohm the installation should be reported "faulty," and so treated.

22. Indoor wiring shall in every case where connected to outdoor overhead wiring have a protector fitted outside or at the point of entry inside the building to prevent danger from crosses with other systems of conductors or from lighting.

23. Outdoor wiring whether overhead or underground must be certified to conform to the latest current specification of the General Post Office Telegraph Department, or the National Telephone Company, and to the requirements of the Board of Trade for the respective methods adopted.

24. Not more than ten installations may be connected by the same circuit to the fire station, substation, or central depot.

25. No street fire alarm box may be connected to an automatic fire alarm circuit except in special circumstances, when a connection to a specially approved box may be allowed.

26. Installations must be so arranged that one break of wires inside the building will not prevent the fire alarm being given.

27. Plans of out-door lines must be kept accessible for reference.

28. An earth return circuit may not be used except on the street side of the transmitter.

EXPANSION PNEUMATIC SYSTEM.

29. The air pressure must never be allowed to fall below 25 lbs. per square inch.

30. An air pump must be permanently attached to the installation and a back pressure valve and a pressure gauge must be fitted on the main pipe at a point near such pump.

31. A continuously audible warning must be given when the pressure falls to 15 lbs. to the square inch. The fire alarm must be given and the transmitter set in operation when the pressure falls to 10 lbs. to the square inch.

32. A test cock must be provided in the main pipe on the installation side of and close to the back pressure valve.

TESTING AND MAINTENANCE.

33. The systems must normally test free from all earth faults on all electric circuits.

34. A daily test must be made to ascertain the condition of each of the batteries and to test the brigade connection, and the result of each test must be duly recorded. The mechanism used in making either test must automatically leave the system in its normal condition, and no severance of the Brigade connection may be made unless a fault-sounding alarm is automatically brought into continuous operation.

35. In addition to the daily test the whole installation must be examined and tested by the installing engineers, and reported upon by them to the insured at least once every month.

36. In the case of expansion pneumatic installations the whole air system must once a month be tested at a pressure of at least 45 lbs. to the square inch, and after a five minutes' interval should not show a perceptible fall during the next thirty minutes.

37. A record must be kept of all false alarms given by the installation, with a note of the ascertained cause of same.

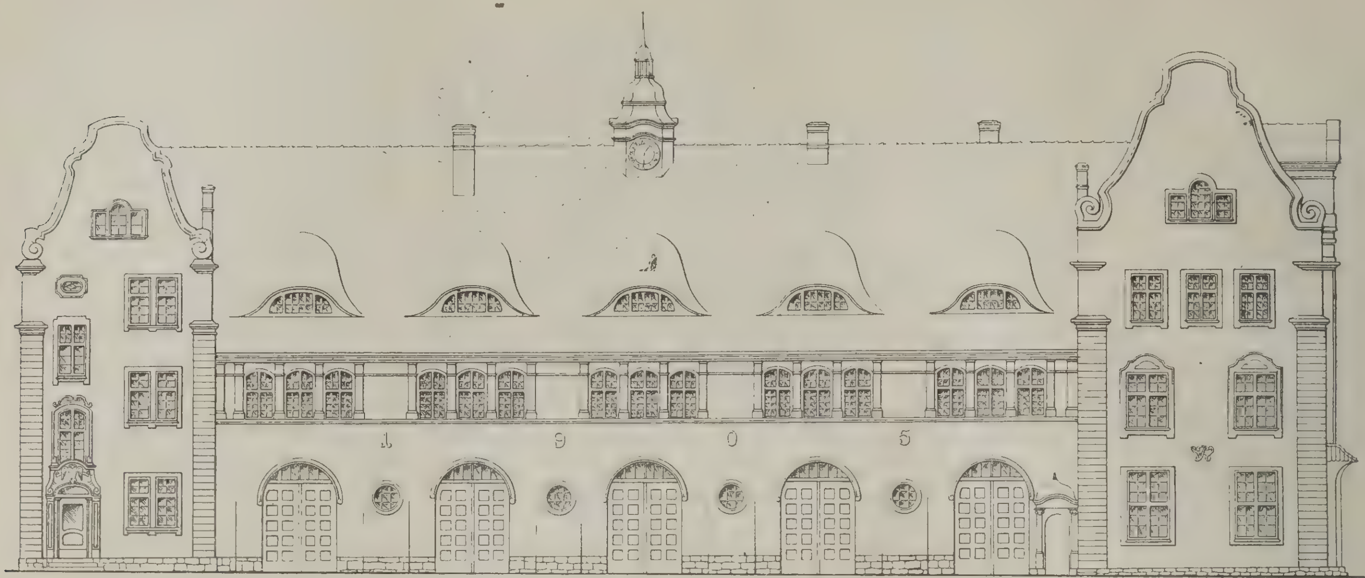
38. Warranties must appear in every policy which allows a discount for a fire alarm installation, requiring the insured to

(a) Make a daily test for the purpose of ascertaining the condition of each of the batteries, and the Brigade connection, and to record the result of such test.

(b) Regularly obtain a monthly report from the installing engineers, and to remedy any defect re-revealed, and to file such report ready for examination by the insuring companies' representatives when required.

(c) Promptly send a notification to the installing engineers of any serious disablement, disconnection or temporary disuse, from any cause, of the installation (except during actual testing) and to file a copy of same with a memorandum of the length of time the installation was inoperative, ready for the examination of the insuring companies' representatives when required.

(d) Immediately notify the insuring company of the removal of any automatic fire alarm installation for which a discount has been allowed, and to return a pro rata share of the discount for the unexpired time.



Front Elevation.

NEW FIRE STATION AT LUBECK

The new fire station at Lubeck, Germany, of which we publish a plan and elevation, may be considered a characteristic modern German fire station; characteristic both in plan and in architectural treatment. The principal feature of the fire station is its engine-house with horse-stalls on either side of the poles of the respective engines. Two features strike one in the plan, namely, the room for a cyclist and the ample accommodation provided for the ambulance. The men's mess-room and quarters are over the engine-house, and there is suitable accommodation in the outbuildings for spare engines.

Ground Floor Plan.
NEW FIRE STATION AT LUBECK.

NOTES ON FIRE PROTECTION.

By Edwin O. Sachs, F.R.S. (Edin.) etc.

(Continued from p. 59, No. 675).

Practical protection must mean smaller annual insurance dues, and the actual extra cost of this protection should be something less than the saving of these dues. Then the nation not only has a smaller dead loss, but the owner also has a smaller annual expenditure for his combined contribution towards the losses, the management of his insurance, and the protective measures. Where there is mutual insurance or municipal insurance in its best sense, the losses by fire and the costs of the protection are often booked in one account, and the better protection up to a certain point should mean a smaller individual annual share. Where there is company insurance, the municipal rates are increased to cover the cost of extra protection, while the insurance premiums are expected to proportionately decrease. Competition and public opinion generally force this decrease of the insurance rates as soon as there is a greater immunity from fire. Where the insurance companies are well managed, and the shareholders are satisfied with reasonable dividends, practical protection can be said to find favour with all concerned; but if the protection is arranged for and the companies do not moderate their charges accordingly, the result for the property owner is by no means a pleasant one. To compare these benefits from the unfair advantage taken: In the Metropolis, and for certain classes of buildings particularly, the insurance rates should have been materially reduced during the past decade. In some cases certain of the rates have been reduced, but these cases are exceptional.

Maintenance of Fire Brigades.

It may be well to at once touch here on the question of insurance companies subscribing towards the maintenance of a fire brigade. The argument which municipalities use is to the effect that the insurance companies derive all the profit from a good fire service, and should contribute towards its cost. Now, as just said, where properly-managed companies have the business, a better fire service means a smaller premium to the ratepayer. If the ratepayer has to pay for extra protection in the form of an increased municipal rate, or in the form of an increased premium raised to meet the contribution levied, it is simply juggling with figures. Of course the contribution in the latter form helps to popularise the municipal budget, but this is not of any real account. Now this is all quite independent of any argument in favour of fire protection being considered in the same light as police protection or sanitation, which are everywhere held to be ratepayers' affairs in the fullest sense of the expression. Municipalities in want of a popular budget do not ask burglary and life insurance companies respectively to contribute to the expenses of their police force or sanitary department. As far as the Metropolis is concerned, the companies, as a matter of fact, contribute a small proportion of the expense of maintaining the fire brigade (under Act of Parliament). For 1908 the amount will be £36,400, the contribution being in form of a tax of £35 per £1,000,000 insured.

Municipal Insurance and Protection.

To refer here to the advantages and disadvantages of municipal insurance in connection with this guide to municipal officials and workers would lead too far. At the most, such municipal insurance could only further the actual protection by the opportunity it would give the authorities to fully realise the extent of the losses and the effect of their efforts. Any saving accruing to the ratepayers, owing to shareholders' dividends and other extra costs not having to be covered in the insurance premiums, should not affect actual protection. Of course, the municipal insurance premiums may be so figured as to leave the authorities a revenue which is devoted to protective measures. This again, however, is generally only done to reduce municipal rates and juggle with figures. The protection actually required remains the same, and the ratepayer will have to pay for it, no matter in what form.

Municipal Insurance.

Municipal insurance if planned with the idea of obtaining a revenue from it is an anomaly, and fire insurance business generally does not lend itself well to official management, except in regard to buildings as distinct from contents. Municipal insurance as to buildings only, has been successfully conducted in some parts of the Continent, but in these cases the chief ambition of the authorities was

simply to arrange for a maximum distribution of losses, a rapid re-erection of buildings gutted, and a reduction of the ratepayers' insurance expenses. An attempt at inter-municipal insurance for municipal buildings only on a mutual system is being attempted on a miniature scale in England, the greater part of the risks, however, being re-insured. This form of municipal inter-insurance is, however, merely a "Class Mutual Insurance." Other London "class" insurance concerns of this type are the Builders', the Theatres' Mutuals, etc.

THE COST OF FIRE PROTECTION.

Building Regulations and Fire Survey.

As to the actual extra cost of a practical system of fire protection above that of the more usual merely combative establishment, one can only say that where changes for the better have been made it is really astounding how cheaply the greater immunity from fire was obtained. In the first place, the special fire clauses embodied in building regulations would of course be attended to by the same executive authorities, who would in any case superintend general structural matters, and that the additional work would at the most require some increased technical or clerical aid. If the execution of the fire survey regulations were delegated to the same authority, there would again simply be some extra clerical aid to pay for and the salaries of perhaps a few extra surveyors. To make the inspections thoroughly efficient, it has been found advisable in instances to form parties of three for the rounds. The second man would in this case be a fire brigade official, and the third probably an architect or engineer in private practice. The cost to the individual building owner is of course at times considerable, but as a rule the expense incurred materially benefits the property apart from the fire question.

Training of the Public.

The cost of the public training would be small, as the elementary part would simply be included in the schoolmaster's work, and the Press matters would scarcely involve outlay. Payments would only have to be made for advertisements, such as for the insertion of lists for fire-call points, etc. The encouragement of methods of "Self Help" would not involve cost beyond an extra expense for the purchase and maintenance of the street appliances.

Fire Call.

The most expensive items in the system of fire protection undoubtedly come under the headings "Fire Call" and "Fire Brigade."As to the former there are quite a number of cities where the cost is modified by having the whole of the electrical service for the police force, the ambulance, and fire brigade, etc., managed by the electrical staff of the brigade, so that the cost is shared by various departments and does not fall solely on the fire budget. The same wires call up each of these services, and as the same staff attend to their maintenance, the fire protection of a city need only be booked with perhaps a third of the outlay it would occasion if managed independently. The combined system has also the great advantage of facilitating the mutual working of the different services in case of an emergency. The conspicuous character of call-points and indicators of course involve an outlay; but here again, if the three services work together, the expenses on the count of fire protection can be lessened. Speaking of money rewards given in some cities to individuals who first call the fire engines, such gratuities can become a heavy item, and should hence be of a moderate figure, say, one shilling.

Fire Brigade.

As to the outlay on the fire-brigade service the most economical and efficient work is generally obtainable from a small permanent staff of high standard supplemented by efficient retained or volunteer reserves. The latter should be as inexpensive as possible, but thoroughly disciplined and easily called for emergencies. Economic fire-brigade budgets cannot allow for a permanent force being ready for such curious coincidences as several large fires starting almost simultaneously, but they must allow for an ample strength always being forthcoming for the ordinary emergencies, and this with all due consideration for men's rest and possible sickness. It is for the unusual occurrences that the reserves are wanted. An undermanned permanent fire brigade is an anomaly, which is generally fatal not only to the property owner but also to the whole efficiency and esprit of the force. The budget must also allow for an attractive pay, as the profession is one which requires men who have a maximum of sterling qualities which we look for in the pick of a nation. It must also not be forgotten that the fire service is one of the few where a system of pensions is the only fair way of recognising the risks of limb and health and at the same time influencing that stability of a force in which practical experience from long service is so essential. The budget must allow for ample modern equipment including an ample reserve of appliances.

Investigation.

Of further expenses which have to be considered, there are items for fire research and fire inquest. If managed economically, due confidence being placed in the opinions of the fire officers and municipal surveyors, there is no reason why the outlay should be great. The statistical work would only require some clerical aid. Where special coroners' courts are held, as in the City of London, some extra money will, of course, be required.

Water Supply.

The last items to enumerate relate to water supply. There are but few places where special fire high-pressure mains are laid on in the interests of fire protection. As a rule the costs which are debited to the heading "Fire Protection" have simply to cover the maintenance of hydrants and tablets, or at the most the cost of the water actually used for fire-extinguishing purposes. Sometimes the cost of hydrants is shared with the scavenging department or the Commission of Sewers, which also have the use of them. Where the provision of water and hydrants falls to a private water company, the property owners will, of course, be paying their share for them, indirectly, in the form of water rates.

Safe Construction and Property Owners.

Now it will have been noticed that all the expenses referred to are such as fall on the public purse, and that I have not taken into account the actual cost of the better construction or arrangements which the Building Act and fire-survey regulations would require. The property owners would have to cover this expense individually, but stability, with due attention to sanitation and fire protection, should be the essence of modern building construction. Inferior construction not only shortens the life of a building, but it is also in every way detrimental to the interests of a *bona fide* investor. Safe construction enhances the value of a property, and protective measures need not occasion much additional expense. They frequently mean an insurance rebate.

Safety of Life and Safety of Property.

The protection of property, in any case, includes measures for the protection of life, as no fire can originate without there being some personal danger. It is practically immaterial if this danger affects the inmates or the firemen. The protective measures will serve for both, and means for life-saving must be forthcoming as soon as possible after an outbreak has been signalled, as the helpers themselves may want them quite as much as those in or near the risks attached. It should also be remembered that both a good staircase and a ladder are often quite as useful for the manœuvring of the firemen as for life-saving purposes, and that they are practically quite as essential for the saving of property as for saving life. No distinction need be made between the two risks, when speaking of fire protection in general; but as the safety of a single human life is always classed higher than that of the most valuable property, it may be well to give life-saving the first place when alluding to the two separately.

Criminal Fire Raising.

Criminal fire-raising does not receive sufficient attention, but there can scarcely be any criminal work where a perfect system of fire protection has been introduced. What with good construction and a fire survey, the quick arrival of the firemen and careful inquests, the risks of detection are by far too great to encourage its growth.

FIRE CALL.

Direct Calls.

There are several methods of transmitting a message calling for the assistance of the fire service. The simplest is of course to run direct to the nearest fire station; but this is only possible where the distance is quite short. In one or two cities, however, the number of sub-stations is so great that they are very close to one another, and hence "direct" calls are generally recorded. This used to be the case in London, where there were many hand fire-escape watch boxes, which were very conspicuous and well-known by the public.

Special Messengers.

Then comes the system of special messengers. The fire is reported at some public office, police station, or guard room, where there are always runners ready to start off to the nearest fire station. The special runner is, of course, here practically a makeshift for the more modern telegraph or telephone line, and the only city in which I know this system to be employed is one where the unsettled political atmosphere has compelled the authorities to prohibit the construction of any telegraph line other than those for the use of the general postal service. Similar messenger services have, however, also been introduced in connection with the telegraphic signalling system—private enterprises known as "general messenger" or "call boy" services, which are organised for business purposes, and have the advantage of the fire-call and the police-call thrown in. In the same way that a cab can be signalled, a call may come for a fire engine, and the ever-ready runner makes off to the fire station instead of to

the cab rank. As a rule, these messenger offices are near the fire station. The combination is really rather a curious one, as it embraces the most advanced notions of giving every "risk" its own fire-call and the somewhat ancient one of the special runner.

The General Telephone.

Another system for facilitating the fire-call relies entirely on the public telephone system, the terms of subscription to which may compel holders to forward fire messages if required to do so. This system allows for such development as the payment of retaining fees to porters in public and other buildings which have a night service, on condition that the fire-call shall be promptly despatched. The telephones are, perhaps, even provided free, if they are not forthcoming; but it should be remembered that the service always goes through a general telephone exchange, which frequently means delay. This delay may be modified by coming to an understanding with the telephone management as to the procedure of dealing with fire-calls.

Special Telephones.

Then there is the special telephone line system, where special wires are laid on to buildings, which are practically open all the year round, direct to their nearest fire stations, and some payment is again made for prompt attention. Sometimes the telegraph takes the place of the telephone, but this requires the porter or attendant to be specially trained to the work. To simplify matters, the buildings are sometimes provided with automatic fire-calls instead of telephones; but the principle of the system remains the same. In districts where there are few public offices, the buildings at which messages can be handed in have been frequently augmented by bakeries or apothecaries' shops where night work is not unusual.

Semi-Public Street Alarms.

What may be termed semi-public street alarms come next. Fire-calls are put up in the street, but their handles are under lock and key, and the keys are only distributed among policemen, watchmen, or householders, and the messages can, hence, only be given by persons known to the authorities. Such calls are to be found sometimes in connection with self-help street boxes.

Public Street Alarms.

The public street-call point is the simplest system next to the direct message. Of course, such fire-calls or telephones can be laid on from dangerous risks, and there has even been an instance where an attempt was made to give every householder a private fire-call. This system is, however, unfortunately too extreme for the municipal purse. If in connection with some other paying enterprise, as in the case of the messenger services referred to, it would be a different matter; though it should also not be forgotten that too great a number of call points means a probable repetition of signals of the same fire. As every call should be answered, with two separate fires quite easily occurring about the same time in the same neighbourhood, there is a risk of too many sections of the fire brigade being on the road to the same fire.

Private Alarms.

Besides these forms of "call" there is also the private alarm. Dangerous buildings are frequently provided with telephones, alarm posts, or even automatic temperature indicators (i.e., thermostats or automatic alarms) by which a call can be given direct from the "risk" involved.

Position and Indication of Call Points.

As to the position of call points, they should not only be conspicuous but they must also be in the most frequented positions. Possibly, in some towns, a point in front of a church would be the best; in others, it may be more advisable in front of a public house. It should always be remembered that every facility should be given to enable as many people as possible to know the whereabouts of the call points without any distinct effort on their part. Red paint may make a call pillar conspicuous by day and a coloured lamp by night.

As to the indications of whereabouts, the plate on every letter-box as to the position of the nearest call point is perhaps one of the best. The letter-box is one of the instruments most in use in a modern city, and so the plate is read by many. Plates put up inside every front door are somewhat extreme measures. In one city small red darts are painted on the glass of every street lamp, indicating the direction to be taken to find a street alarm. This sign, however, has the disadvantage of requiring a previous knowledge of its meaning. It is generally useless to a stranger in the town.

Rewards for Calls.

As to rewards paid to messengers, they vary from one shilling to half a sovereign. In some places every call is rewarded, that is to say, even those to chimney fires, and this often results in an abuse of the privilege. Urchins have been known to light bogus fires on the top of a chimney and then run to call the engines. If a reward be given, a limitation should be made. In one town no relation or employé of the owner receives a reward. In other cities no rewards are given for calls. The value of the reward, of course, depends on the value of money in the respective localities, but one shilling is generally quite sufficient.

(To be continued.)

A FIREPROOFING MATERIAL.

A striking testimonial to the efficiency of "Uralite"—that well-known light-weight fireproofing material made in large sheets of various thicknesses suitable for roofs, walls, ceilings and partitions—has recently been received by the British Uralite Co. Ltd., of 16, St. Helen's Place, London, E.C., from Messrs. Parnell and Sons, Ltd., of Bristol, who write as follows:—"You will be interested in knowing that we had a fire in our packing department. We had taken the precaution of lining this department with 'Uralite,' and thus prevented the fire from spreading beyond the room where it started, and only trifling damage resulted. Had it not been for the 'Uralite,' it is almost certain that the whole of our Narrow Wine Street premises would have been burnt out, and the damage would have run into thousands of pounds."

SIR A. BRUMWELL THOMAS, F.R.I.B.A., has been appointed hon. architect to the National Society of Day Nurseries.

NORTH TO SOUTH TRAMWAYS.—Before the end of April passengers will be able to travel through by tramway from Highbury to almost any part of South London, the extension of the Aldwych tube to the Victoria Embankment being practically completed.

IN PARLIAMENT.

(From Our Press Gallery Representative).

The Queen Victoria Memorial.

It was to be expected that one of the first questions addressed to Ministers this session would relate to the progress of the Queen Victoria Memorial. Sir William Collins asked the First Commissioner of Works whether he could fix a date for its completion.

Mr. Harcourt replied that the lower part of the memorial, including fountain basins and bas-reliefs, would, he hoped, be finished and open before Whitsuntide. He could not yet say when the whole memorial would be completed, as this depended partly on the supply and delivery of the marble.

Irish Firms and the Haulbowline Extension Works.

Captain Donelan asked the Civil Lord of the Admiralty whether he could state the rate of wages paid to skilled and unskilled workers, respectively, in the Norwegian quarries, from which granite was to be procured for the extension works at Haulbowline, and the number of working hours per day; whether he was aware that the specification originally sent to all the Irish firms invited to tender for the lengthening of the dry dock at Haulbowline contained the condition that limestone should be the material used for the principal part of the masonry work; whether all the Irish firms were afforded an opportunity of amending their tenders when permission was subsequently given to substitute Norwegian granite for limestone; if he could state the reasons which influenced the Admiralty to alter the original specification and permit the substitution of Norwegian granite for limestone; and whether he was aware that quantities of Irish limestone were used in the construction of the great docks at Cardiff opened last year by His Majesty the King.

Mr. Lambert, in reply, said the Admiralty had no information on the subject of the first question. With regard to the other questions, Irish stone was originally specified for certain parts of the masonry, but between the time of inviting tenders and the date for their delivery, certain of the firms requested permission to substitute granite for Irish stone. Granite, in the opinion of the Admiralty, being a better material, alternative tender prices were sanctioned, and all firms were treated exactly alike. In every case where alternative prices were quoted, granite was considerably lower in price than Irish stone. The Admiralty, with every desire to assist local industry, could not exclude the use of a material which was superior in quality and cheaper in price.

Building Trade in Berlin.

Mr. Leverton Harris asked the President of the Board of Trade whether he had any official information showing how far the present unemployment in Berlin was due to strikes in the building and timber trade; and whether he could state how many of those at present tabled as unemployed belonged to these trades.

Mr. Kearley, in reply, said: So far as I am aware there is no strike at present in the building or wood-working trades of Berlin, but there is a large amount of unemployment resulting partly from disputes occurring last year and partly from the high rate of interest ruling for loans to builders. Figures published by the Berlin Trades Council, however, in-

dicate that, of the total unemployed membership of trade unions on January 15th, making returns, about one-half consisted of building and wood-working operatives. I may add that the percentage of trade union members returned as unemployed on that date to the Berlin Trades Council was 14.1.

The King and Holyrood Chapel Restoration.

Some interest was excited North of the Tweed by the Earl of Stair's statement at a meeting of the Convention of Royal and Parliamentary Burghs that the King was not favourable to the restoration of Holyrood Chapel—a project made possible by the will of the late Earl of Leven and Melville, but which did not commend itself to the trustees, in whom discretionary power in the matter was vested.

Mr. Charles Price, one of the Edinburgh members, questioning the First Commissioner on the subject, asked whether the trustees had been prevented from carrying out the trust, and whether he proposed to take any action.

Mr. Harcourt's reply was in these terms: "My attention has been called to the statement of the Earl of Stair, which was probably made under some misapprehension. The executors of Lord Leven's will believed that the legal formalities connected with the probate of the estate required an application to the King for a formal decision on the question of the restoration of Holyrood. In view of all the surrounding circumstances, and in consequence of the refusal to act by the persons designated to carry out this portion of the will, I felt it my duty to advise His Majesty that I should, on his behalf, decline to give permission for the work. As the Minister charged with the maintenance of the fabric, I accept full responsibility for the advice which I tendered to His Majesty. I propose to take no further action in the matter, which is now closed."

THE EVOLUTION OF THE STORAGE BATTERY.

To many, no doubt, the progress made towards perfecting the storage battery may appear slow. Superficially its appearance is much what it always was, and its treatment differs little from what was usual many years ago. Nevertheless the development has been real, and the improvements effected in detail have resulted in the production of an article that requires little skilled attention, and of which the depreciation is no higher than other parts of the electric-lighting plant, of which it is an integral part.

The popularity of anything is largely dependent on the area from which it can attract those who can take it up, and the probable explanation of the rapid spread of electric-lighting plants to-day, particularly those of small size, is to be found in the fact that the standard apparatus employed can be looked after by any intelligent person, who may never have seen an installation before.

In the early days of the industry the storage battery, as then constructed, however electrically perfect it may have been, was mechanically weak, and was a constant source of trouble through buckling of the plates. Moreover, little or no provision was made for sufficient space underneath the plates to accommodate the deposit which is thrown down in working, and it was necessary, therefore, to dismantle the cells at frequent intervals in order that this could be taken away. Constant watchfulness was required to detect and remove any internal contacts between positive and negative plates caused by pieces of scale or active material. Attempts were made to obviate buckling by increasing the thickness of the plates, but this was only partially successful, as the stresses produced, which result in buckling, are far greater than such a comparatively weak metal as lead can resist.

A radical departure was made by the Chloride Electrical Storage Co., Ltd., in "building up" their positive plate (Fig. 1), that is to say, instead of making their plate, which is of the Planté type, entirely of lead, as had hitherto been the practice, they cast the grid as a separate operation, using a special antimonial lead mixture, which possesses great strength and stiffness, the holes in it being countersunk on both sides. The active material, which consists of pure lead tape wound up into spirals, corrugated in such a manner as to allow the electrolyte to circulate right through the plate from one side to the other, is placed in the holes in the grid, and being subsequently expanded during the process of formation becomes firmly keyed in. It will thus be seen that the mechanical strength of the plate is entirely independent of the lead which is utilised for the active material, and is unaffected by the life of the plate, in contradistinction to the ordinary Planté plate, which is dependent for its strength on the lead in the plate; moreover, this latter, in course of time, becomes converted into peroxide, thus diminishing to a serious extent any mechanical stability which the plate originally possessed. The enormous surface offered by the corrugation of the active material to the electrolyte allows of a very light formation in order to obtain from the plate its rated capacity. The amount of deposit from the plate during its life is thereby reduced to a minimum.

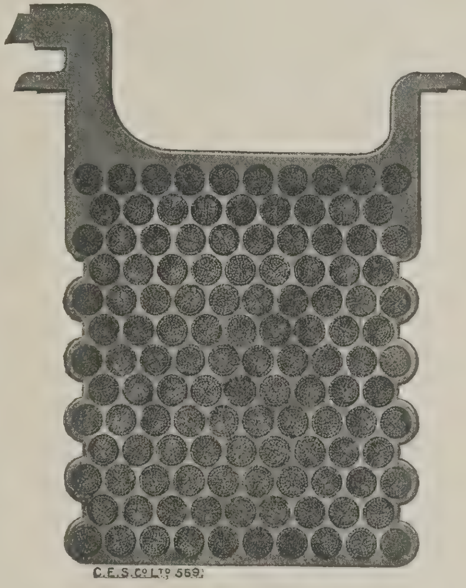


Fig. 1. Positive Plate.

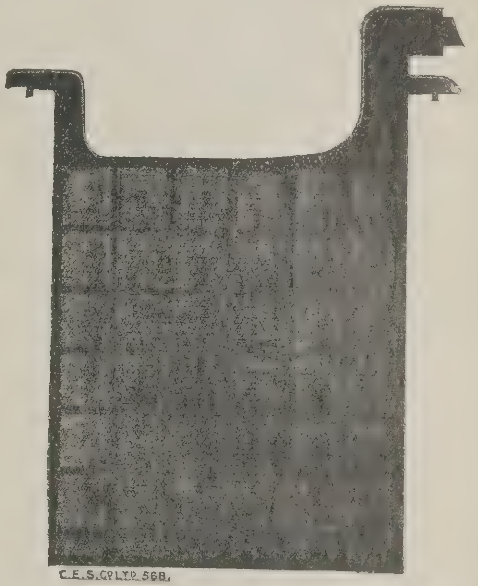


Fig. 2. Negative Plate.

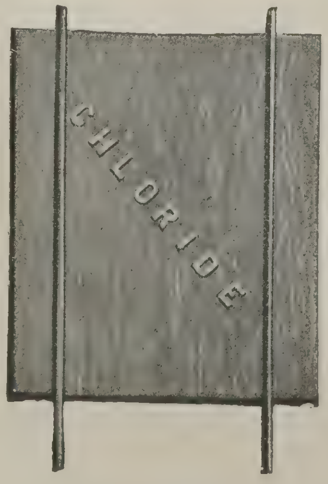


Fig. 3. The Separator.

Fig. 4. The Complete Cell.

THE CHLORIDE ACCUMULATOR.

The negative plate (Fig. 2) is also of distinctive design. Instead of the usual pasted grid, the frame is made in two halves riveted together after the insertion of the active material, which is thus contained in a series of small cages or boxes, from which the plate derives its title of "box" negative. It will be noticed from the illustration, Fig. 2, that the outside of the plate is covered with a finely-perforated sheet of lead, which prevents the active material from falling out. This method of construction is a very great improvement on anything hitherto produced, its chief advantage being that the capacity of the plate can be maintained practically constant over a long period of years, the arrangement of the active material and its special composition together proving an ideal combination.

But the most striking feature of the "Chloride Accumulator" is the unique form of separator which the Chloride Electrical Storage Co. put on the market in 1903. In every type of cell, except the two smaller sizes, the old-fashioned glass rods or ebonite forks have been discarded in favour of the patented wood separator, which consists of a thin sheet of wood, the exact size of the plates with which it is employed, supported by two wooden dowels, which in turn rest upon the bottom of the box containing the element (see Fig. 3). The wood forming the separator is subjected to a special treatment before being put into the cell, which entirely removes from it all substances that would otherwise be deleterious to the plates, and cause rapid disintegration. It is arranged as a continuous diaphragm between plates of opposite polarity, it entirely prevents any treeing across (which is liable to be a source of continual trouble and worry), and thus largely obviates the constant inspections which were necessary with the older forms of separation. Further, it tends in a peculiar manner to maintain the capacity of the cell in a way which is not possible when either glass rods or ebonite forks are employed. The wood separators are put into the cell moist, there being nothing else whatever between adjacent plates, even in the largest sizes, and no change whatever in the appearance or composition of the wood is discernible after a prolonged period of use, extending over many years.

A fruitful cause of trouble with accumulators in the past has been the effects of the acid spray on the wooden trays supporting the cells, and on the sawdust which they contain, on which the glass boxes are bedded. The Chloride Co. have entirely discarded the use of trays for all cells in glass boxes, except the larger sizes; they employ instead a soft lead disc between the top of the insulator and the bottom of the glass box. This acts as a buffer between glass and glass and prevents the box from slipping, thus performing all the functions served by the old-fashioned tray without its disadvantages.

The corrosion of the bolts used for connecting adjacent cells has been obviated by using studs with lead covered nuts. These are of harder metal than the lugs, and when tightened up bite into the lug, effectually preventing any acid spray from attacking the stud.

The cells are made in standard sizes with capacities varying from 7 ampere hours to 10,000 ampere hours, the distinctive types being applicable to every branch of electrical engineering in which accumulators can be employed. Fig. 4 shows one of the standard types.

New London Buildings.

At yesterday's meeting of the London County Council the Building Acts Committee and the Theatres and Music Halls Committee reported the following applications under the London Building Act, 1894, their recommendations as to consent or refusal being appended in *italics*:—

Iron and glass canopies over the doorways of five proposed houses between 21 and 27, Wellington Road, Old Charlton, on the application of J. Rowland, on behalf of H. W. Budd. (*consent*).

Studio and caretaker's dwelling in the grounds of Grove House, to abut on the eastern side of Albert Road, St. Marylebone, on the application of J. Tatchell, on behalf of S. Gotze (*consent*).

Church and presbytery on the north-eastern side of Ellison Road, Wandsworth, on the application of J. H. Beart-Foss, on behalf of the Very Reverend Canon St. John (*consent*).

Building on the western side of Charlotte Street, Woolwich, on the application of J. E. Edwards, on behalf of H. Hart (*consent*).

Building with one-storey shop in front, on the eastern side of Upper Grange Road, Bermondsey, on the application of T. Sloman (*refusal*).

Three houses on the western side of Ardgowan Road, Catford, on the application of R. Stewart, on behalf of A. Cameron Corbett, M.P. (*refusal*).

One-storey shop at 74, Caistor Road, Balham, on the application of J. H. Beare (*refusal*).

Smith's shop and plant store at the premises of Messrs. Allen and Co., Pimlico Wharf, Grosvenor Road, Westminster, on the application of Messrs. Allen and Co. (*refusal*).

Building upon the sites of Nos. 12, 13, and 14, Half Moon Passage, City, on the application of H. Wright, on behalf of G. Chase (*consent*).

One-storey stable building at the rear of No. 46, Blackshaw Road, Wandsworth, on the application of W. G. Lawrence (*consent*).

Building between Nos. 207 and 211, Cable Street, Whitechapel, on the application of B. J. Capell, on behalf of Sly, Dibble and Co. (*consent*).

One-storey addition to the premises of C. Ash, Sons and Co. (1905), Ltd., on the south-eastern side of Anglers' Land, Kentish Town, on the application of A. J. Perriam, on behalf of C. Ash, Sons, and Co., (1905), Ltd. (*refusal*).

Bankruptcies.

During the week ended February 7th, thirty-five failures in the building and timber trades of England and Wales were gazetted.

W. Wright, builder, Nuneaton. R.O., January 29.

H. G. Dodwell, timber dealer, Cheltenham. R.O. January 30.

T. Kennedy, joiner and builder, Middlesbrough. R.O., January 27.

H. G. Heal, builder, Worthing. Liabilities, £3,446; assets, £1,606.

Betteridge and Featherstone, builders and contractors, Parkstone. R.O., January 31.

T. Williams, builder, Colwyn Bay. P.E., Magistrates' Room, Bangor, March 5, at 12.30.

Brown and Co., builders, Letchworth. P.E., Bankruptcy Court, London, March 6, at 11.

F. Cockrell, builder, Gorleston. P.E., Town Hall, Great Yarmouth, March 17, at 11.

E. Bell, builder and contractor, London. P.E., Bankruptcy Court, March 11, at 11.30. R.O., January 28.

J. Waterhouse, builder, Bearwood, West Bromwich. Gross liabilities, £363; deficiency, £159. P.E., adjourned until February 21.

F. C. Davis, builder, London. First meeting, Bankruptcy Court, February 14, at 11. P.E., same, March 11, at 11. R.O., January 28.

J. W. Wiles, builder, Croydon. First meeting, 132, York Road, S.E., February 14, at 12. P.E., Croydon C.C., February 25, at 11. R.O., January 30

H. D. Rich, builder, Colville. First meeting O.R.'s, Norwich, February 15, at 12.30. P.E., Town Hall, Great Yarmouth, March 17, at 11. R.O., January 30.

P. M. Roberts, architect, London and Brightlingsea. First meeting, Bankruptcy Court, February 13, at 12. P.E., same, March 3, at 11. R.O., January 30.

Insurance.

Subscribers to "The Builders' Journal" are entitled to a Free Insurance for £500. Every subscriber should apply for this, sending a postcard with the name of the newsagent with whom the order has been placed. Subscribers can also obtain a General Accident and Sickness Insurance (the "Lighthouse" policy) at a reduced premium, which includes the Annual Subscription to this Journal. A pamphlet giving full particulars can be obtained free on application.

Coming Events.

Wednesday, February 12.

Northern Architectural Association. — Mr. Joseph Oswald, F.R.I.B.A., on "The Glory that was Greece," at 7.30 p.m.

Edinburgh Architectural Association. — Mr. Moritz Kahn on "Practice and Methods of Modern Reinforced Concrete Construction," at 8 p.m.

Institution of Civil Engineers.—Students' visit to the testing works of Messrs. Kirkaldy and Son, 99, Southwark Street, S.E.

Thursday, February 13.

Society of Architects.—Mr. G. Topham Forrest on "County Council Schools: their General Arrangement and Method of Building," at 8 p.m.

Leeds and Yorkshire Architectural Society.—Mr. T. H. Mawson, Hon.A.R.I.B.A., on "English and Italian Garden Architecture."

Manchester Society of Architects.—Prof. C. H. Reilly, M.A., A.R.I.B.A, on "The Grand Manner in Architecture," at 6.30 p.m.

Sheffield Society of Architects and Surveyors. —Mr. Moritz Kahn on "The Practical Side of Reinforced Concrete."

Friday, February 14.

Birmingham Architectural Association.—Mr. E. F. Reynolds on "Architecture, East and West."

Edinburgh Architectural Association.—Associates' Annual Dinner.

Glasgow Technical College Architectural Craftsmen's Society.—Mr. Dugald M'Kellar on "Building as it is generally done."

Saturday, February 15.

Royal Institution.—Mr. Selwyn Brinton, M.A., on "The Art of Florence."—I., at 3 p.m.

Incorporated Clerks of Works Association.—21st annual dinner, Hotel Cecil, at 6 p.m.

Monday, February 17.

Royal Institute of British Architects. — Mr. Francis Fox, M.Inst.C.E., on "Foundations, the Use of Divers, and the Grouting Machine."

Liverpool Architectural Society.—Mr. E. Willoughby Faulkner on "Holland."

Institute of Sanitary Engineers.—Mr. H. G. Turner on "The Collection and Storage of Water for Domestic Purposes in connection with Farmhouses and Villages," at 8 p.m. (Bronze Medal Essay).

Tuesday, February 18.

Institution of Heating and Ventilating Engineers.—Annual General Meeting, Institution of Mechanical Engineers, Storey's Gate, Westminster, at 6.30 p.m. Mr. W. Nelson Haden, J.P., M.I.M.E., on "The Heating and Ventilation of School Buildings." Mr. W. H. Casmey on "Warming and Ventilation."

Wednesday, February 19.

Architectural Association (Camera and Cycling Club).—Prof. Beresford Pite, F.R.I.B.A., on "Domed Churches," at 7.30 p.m.

Friday, February 21.

Institution of Mechanical Engineers.. — Prof. John Goodman on "Tests of a Live Steam Feed-water Heater," at 8 p.m. Annual Report of Council.

Saturday, February 22.

Architectural Association.—Fourth Spring Visit, to Messrs. Mappin and Webb's new premises in Oxford Street, at 2 p.m.

Monday, February 24.

Surveyors' Institution.—Ordinary general meeting, at 8 p.m.

Wednesday, February 26.

Manchester Society of Architects (Club Night). —Mr. Halliday on "Ruskin," at 6.30 p.m.

Architectural Association.—Mr. Thomas H. Mawson on "Garden Architecture."

Surveyors' Institution.—Annual Dinner, Hotel Metropole, at 7 p.m.

Northern Architectural Association (Students' Meeting).—Mr. H. L. Hicks on "Some Norfolk Churches," at 7.30 p.m.

Friday, February 28.

Birmingham Architectural Association.—Prof. A. Bereford Pite, F.R.I.B.A., on "Domed Churches."

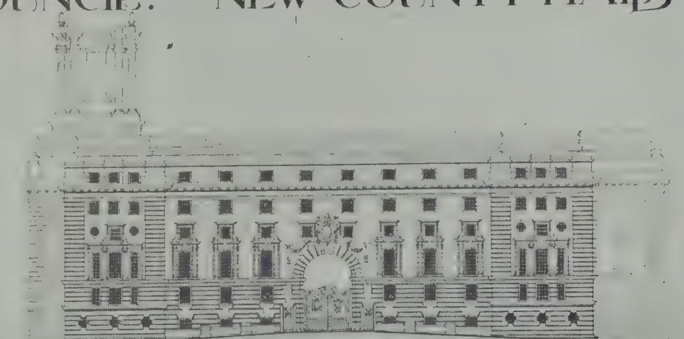
Glasgow Technical College Architectural Craftsmen's Society.—Mr. Alex. T. Heathcote on "The Architectural Criticisms of Ruskin."

Saturday, February 29.

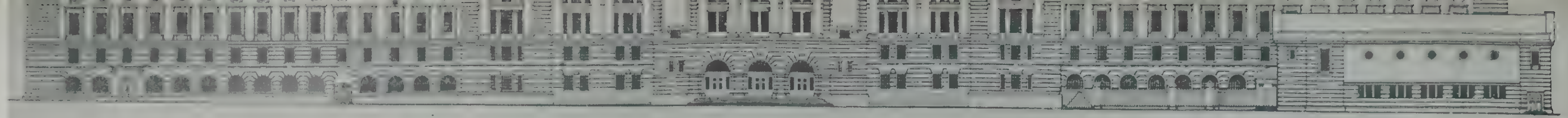
Institute of Sanitary Engineers.—Visit to Southwark Refuse Disposal Works.

ELEVATION TO RIVER THAMES.

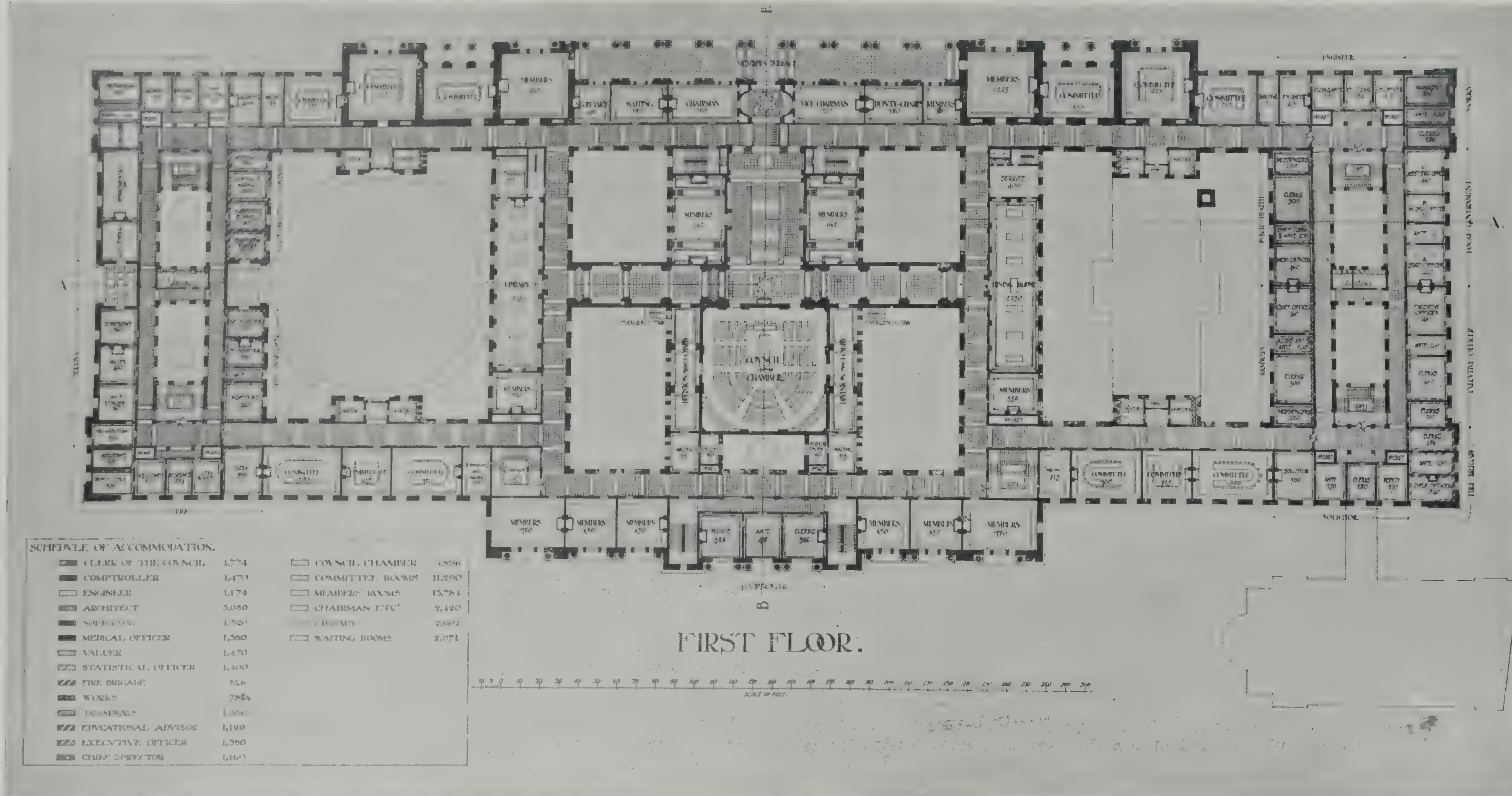
LONDON·COUNTY·COUNCIL: NEW·COUNTY·HALL



ELEVATION TO WESTMINSTER-BRIDGE RD.



ELEVATION TO BELVEDERE ROAD.



DESIGN BY HENRY T. HARE, F.R.I.B.A.

February 19, 1908. Volume 27, No. 680.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 364, Westminster.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

The Proposed Diploma in Architecture at Cambridge. The publication of the report of the syndicate appointed, in June, 1907, to consider the desirability of instituting a diploma in architecture at the University of Cambridge seems to have caused considerable excitement among architects. In the "Times" of January 27th was published a letter signed by Mr. T. G. Jackson, R.A., Mr. Reginald Blomfield, A.R.A., and Mr. Basil Champneys, strongly deprecating the syndicate's proposal to institute a school of architecture. Mr. Philip E. Pilditch followed with a letter (in which the merits and demerits of the scheme are, on the whole, fairly and ably discussed) supporting the syndicate's proposal, and, incidentally, mentioning the undoubted fact that the expression of opinion, on the general question, put forward by Mr. Jackson and his colleagues is "by no means that of the whole of those who profess and practise architecture in this country." On the other hand, Professor Reilly of the University of Liverpool, appears to be in accord with the authors of the first letter referred to above, but Mr. Edward Warren, who, while (in our opinion) rightly objecting to the "granting of diplomas or degrees bearing any significance of professional equipment," welcomes the establishment of architectural schools with examinations (since examinations are inevitable), contributory to the ordinary diplomas or degrees. The subject of the professional training of architects is one of such vital importance to the whole profession that we think the fullest publicity should be given to the syndicate's proposals, which, in brief, include the institution of a special examination, in two parts, for the ordinary B.A. degree. Part I. of this examination, being of a purely technical character, is to embrace such subjects as practical mathematics, applied mechanics, strength of materials, descriptive geometry, and surveying, while Part II. is to consist of the history of architecture in Europe and the near East, outlines of the general history of art, architecture and the allied arts, subjects for an essay on a selected period, and the theory of art in relation to architectural design. In effect, as Mr. Pilditch has pointed out, the institution of the proposed scheme will simply result in offering to architects of the future educational advantages equal to those long since enjoyed by undergraduates of Cambridge destined to become lawyers, clergymen, engineers or doctors, but who do not intend to present themselves for one of the various tripos examinations. Mr. Jackson, Mr. Blomfield and Mr. Champneys object to the proposed scheme *inter alia* on the ground that it provides "no sound general education on liberal lines." The obvious answer to this criticism is that the scheme provides for the acquisition of precisely the same general education as that enjoyed by the ordinary poll degree man destined for other professions, and that the, possibly, small amount of knowledge of the theory and practice of architecture to be acquired by a student of architecture during his residence at Cambridge will be as useful to him in his after-career as an equivalent amount of special knowledge obtained under similar circumstances by an embryo clergyman, doctor, lawyer or engineer. We are quite unable to support some of the other arguments advanced by Messrs. Jackson, Blomfield and Champneys, many of which have been ably answered by Professor Waldstein. For instance, to say that the proposal has not the advantage of the existing system of apprenticeship (to which the Cambridge course is only intended to be supplemental) is altogether beside the mark, and while we quite agree with the assertion that "applied science, history, and archæology enter into architecture, but they are not architecture," we think that architects will not condemn the University of Cambridge for proposing to include these subjects in the curriculum of study for the special examination of students who intend to become practising architects. We are very glad to hear, from the authors of the joint letter, that the training of architects in this country has been "re-organised in the last few years," either by "architects themselves" or by anybody else, and we are curious to know *where* this system of training, following, as we naturally assume, "a sound general education on liberal lines," is in operation. In a second letter to the "Times" of Thursday last Messrs. Jackson, Blomfield and Champneys reply to the letters of Professor Waldstein, Mr. Fletcher, and others, but we are still convinced that the proposal put forward by the syndicate is one that cannot fail to be of benefit to the architectural profession, whilst, incidentally, its adoption should tend to stimulate public interest in the art of architecture: and that result alone would be, in our opinion, of inestimable value to the profession.

Architects and the Corrupt Practices Act. In the R.I.B.A. "Journal" for February 8th an opinion by an eminent barrister, Mr. W. O. Danckwerts, K.C., is given on the position of the architect under the Corrupt Practices Act, 1906, when acting also as quantity surveyor, and including certain charges in the bill of quantities. The following four questions (formulated by a firm of solicitors acting under the instructions of Mr. J. Alfred Gotch, F.R.I.B.A., of Kettering) were put to Mr. Danckwerts: "(1) Does an architect by acting also as quantity surveyor, and be-

ing paid by the contractor, as stated in the summary, without having informed the building owner, render himself liable to prosecution under the Prevention of Corruption Act, 1906? ; (2) Does an architect, acting also as quantity surveyor, who puts into the bill of quantities, without informing the building owner, a sum of money to be paid to him by the contractor for printers' and lithographers' charges for printing the bill of quantities, render himself liable to prosecution under the Act? ; (3) Does an architect acting also as quantity surveyor, by charging remuneration for revising the bill of quantities where there is a variation in the works, without informing the building owner, render himself liable under the Act? ; (4) Does an architect who puts in the bill of quantities a sum of money to be paid to him by the contractor for copies of drawings other than the first set, without informing the building owner, render himself similarly liable?" Mr. Danckwert's answer to all four questions is: "He does not. In order that an offence may be committed, the thing must be done corruptly, and merely doing honestly what is indicated by the question is not corrupt." As regards question (4), however, he adds that "under the forms herewith, the cost of these should be borne by the builder"; and he gives this final opinion :—"That the system of charging the employer through the builder for bills of quantities is not a commendable one, because it is calculated to mislead the employer, if not to conceal the fact of payment from him. The better practice would be for the architect to get his pay direct from the employer."

An Inexpensive Architectural Publication.

We have before us a copy of "The Practical Exemplar of Architecture," the "First Reprint" of which has recently been published by the proprietors of THE ARCHITECTURAL REVIEW. The work comprises a small portfolio with plates of 120 fine examples of doors, cupolas, gate piers, screens, staircases etc., the whole being selected by Mr. Mervyn Macartney, B.A., F.R.I.B.A. The object of the work is to place before architects absolutely reliable and correct reproductions of all that pertains to the practice of architecture, "so that an architect, or for that matter anyone, could reproduce a given subject, from a chimney stack to a door-knob." It is not Mr. Macartney's intention to increase the already numerous host of adapters, but to ensure the correctness of their adaptations, for, as he remarks with perfect truth, the dull copyist will exist in any circumstances —he cannot be eliminated, but he can be provided with "pot-hooks" that are worth imitating. It is consoling, therefore, to think that the standard of design attained, even by the mere adaptor, will certainly not be lowered by the publication of this very useful, practical, and inexpensive work. Every care has been taken to indicate, as far as possible, the construction of the various large-scale details which appear on the geometrical drawings, while the accompanying photographs are excellent examples of architectural photography. The editor and the publishers are equally to be congratulated on their work.

The new Secretary of the Institute.

As already announced in our columns, Mr. G. Ian MacAlister has been appointed Secretary of the Royal Institute of British Architects in succession to Mr. W. J. Locke, who, as our readers are aware, retired from the position, after occupying it for ten years, in order that he might devote his whole time to play-writing and literature, in which field he has secured such distinction. We give on this page a portrait of Mr. MacAlister, which, with the following brief note on his career, will serve, so to speak, as a sort of informal introduction of the new secretary to the members of the Institute throughout the Kingdom who will have dealings with him in the course of matters architectural, but to whom Mr. MacAlister is at present a name only. No fewer than 123 applications for the secretaryship were received by the Institute, and the task of making the best selection was no easy one for the two past-presidents, Sir Aston Webb and Mr. John Belcher, entrusted with the matter: it was not until after four meetings had been held, and several of the candidates had been interviewed, that the final selection was made—a selection unanimously approved at a full meeting of the Council on February 3rd. Mr. MacAlister, who was an exhibitioner in modern history of Merton College, Oxford, graduated with honours in Classics and Literæ Humaniores in 1901. After leaving Oxford he served for two years as secretary and aide-de-camp to Major-General the Earl of Dundonald during his command of the Canadian forces; and since his return to England he has been engaged in literary and journalistic work. It is interesting to note that Mr. MacAlister's father—Mr. J. Y. W. MacAlister—is the secretary of the Royal Society of Medicine, while his uncle —Dr. Donald MacAlister—is Principal of Glasgow University, and President of the General Medical Council. The new secretary comes to the Institute a young man with abundant qualifications (he is only 29 years of age), and we wish him the greatest success in the work that lies before him.

MR. G. IAN MACALISTER, B.A. OXON.
The new Secretary of the Royal Institute of British Architects.

The Great French Sculptors.

In his concluding lecture at the Royal Academy last Thursday, Mr. Colton, A.R.A., in his capacity of Professor of Sculpture at the Academy, dealt specially with the great French sculptors, Carpeaux and Barye and Dalou — the last-named having influenced considerably the modern English school. Carpeaux and Barye, said Mr. Colton, were the founders of that school of French sculptors whose work in the future would stand with that of the great periods of Greek and Italian art. Barye would probably influence animal sculpture for all time, and Carpeaux was a man whose technical skill was extraordinary. It was said of him that he could make stone and marble dance. In England, contemporary with these remarkable men, we had a sculptor of even higher powers, Alfred Stevens. But we were not then ready for him, and his was "a voice crying in the wilderness." Dalou was the Rubens of sculpture, in his power of suggesting masses of soft palpitating flesh. A staunch Republican, Labour was his god, and the last dream of his life was his great monument to Labour, a monument that he was never to complete. Dalou fought through the Franco-Prussian War, and then his political opinions led him to identify himself with the Commune. When that was suppressed, Dalou was proscribed, and came to England, where he remained for some years. Mr. Colton referred also to St. Gaudens, the best sculptor American had yet produced, and he added a few words about modern English sculpture, taking as examples Harry Bates and Onslow Ford. Bates, in whose work we saw something of the true Hellenic spirit, might, had he lived, have achieved almost anything; and Ford at times touched greatness. His statue of Irving as Hamlet ranked with the best work of its kind in the sculpture of any country.

Our Insurance.

In connection with our Accident Insurance Scheme (open to all subscribers to THE BUILDERS' JOURNAL) we have lately paid a considerable number of claims—one, in fact, last week for £12, in settlement of a claim for an accident which happened to an architect. During the three years the insurances have been running we have paid away more than £1,000 in claims. This should serve as a reminder of the risk which architects run in going over their buildings in the course of construction, as well as the ordinary risks in travelling, and the risks of infectious and other diseases—all of which are covered by the "Lighthouse" policy.

FIG 1.—VERSAILLES: GENERAL VIEW FROM COUR DE MARBRE.

THE CHATEAU OF LOUIS XIII. AND THE PALACE OF VERSAILLES.

Although it is now indissolubly associated with the life and court of the "Grand Monarque," yet the actual founder of the immense palace of Versailles was Louis XIII., who first erected, on land purchased from Jean de Soisy and adjoining the estates comprised in the seignory of Versailles, a small hunting pavilion. This insignificant building was subsequently superseded, in 1624-1626, by a square-built symmetrically arranged brick and stone château of moderate size designed in the quaint and picturesque style of the early Renaissance. In 1632 Louis XIII. acquired from Jean Francois de Gondi, first Archbishop of Paris, the land and seignory of Versailles, and from this date the King, drawn hither by the attractions of the chase, made from time to time large additions to the already extensive gardens and parks that surrounded his modest building. Owing, in all probability, to the fact that the popular taste in art was being rapidly carried towards that phase of extravagant decoration which was to reach its zenith sixty or seventy years later, the unpretentious and homely character of the design of the royal chateau does not appear to have met with the approval of contemporary critics. For instance, Saint Simon, the trenchant chronicler of the court of Louis XIV., called it "un petit château de cartes," and Bassompierre declared it was "un chétif château de la construction duquel un simple gentilhomme ne pourrait prendre vanité." But despite these adverse criticisms, the hunting box of Louis XIII. was, on the whole, a good example of the work of an able architect, whose identity, owing to the divergence of opinion of many authorities, it is now difficult to ascertain.

Most of the writers on Versailles insist that Lemercier, who was born at Pontoise towards the end of the 16th century, and died at Paris in 1660, was the architect of the original château, and there is no doubt that, through Richelieu's influence, Lemercier was appointed first architect to the King. However, Mons. Pierre de Nolhac, whose official appointment as curator of the museum at Versailles, entitles him to speak with special authority, states that the architect of Louis XIII.'s château was Solomon de Brosse (*vide* "Versailles and The "Trianon," by Pierre de Nolhac). But whether designed by Lemercier or by de Brosse it is evident that the building, with its brick and stone facades and high-pitched roofs, was of a very interesting character. It consisted of a main group of buildings flanked by four pavilions, symmetrically arranged on the north, south and west sides of a courtyard (afterwards the celebrated "Cour de Marbre,"

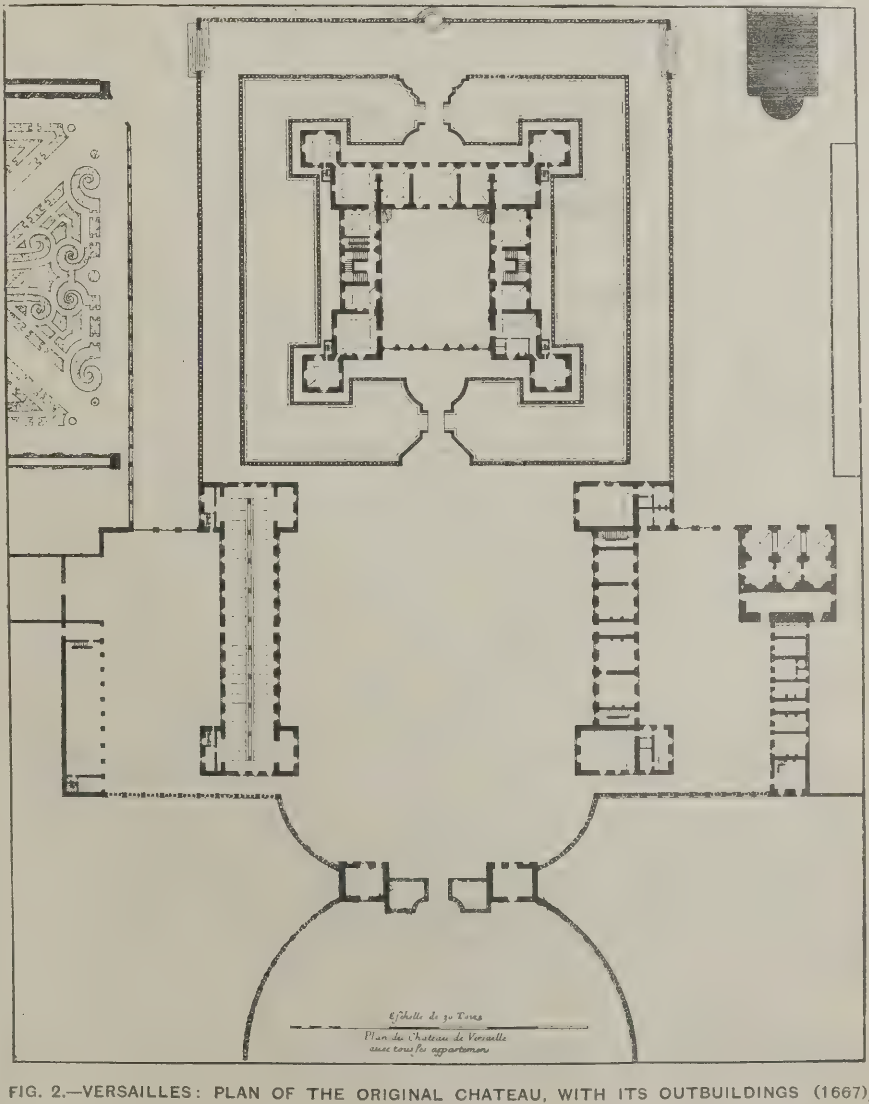


FIG. 2.—VERSAILLES: PLAN OF THE ORIGINAL CHATEAU, WITH ITS OUTBUILDINGS (1667).

of Louis XIV.), the whole being encircled by moats and low balustraded walls. The subsidiary accommodation, comprising the servants' quarters and the royal stables, was contained in two blocks of buildings, placed in the large front court of the château: the three groups of buildings, congregated near the eastern boundary of the site, being separated by a stone arcaded screen and small entrance lodges from the enclosed circular-shaped front approach. (See plan on preceding page).

Although the greater part of the original château has been absorbed by later additions, yet portions of the older building are to this day closely discernible in the marble court. In spite of this, however, it would not now be possible to conjecturally reconstruct the building of Louis XIII., with any degree of confidence, were it not for the fortunate circumstance that a folio volume of engravings of the Château of Versailles, as it appeared at various periods of his reign, was published, with the approval (or perhaps by command) of Louis XIV.* These engravings, executed chiefly by Israel Silvestre, are of great interest in exemplifying the evolutionary process by which the small château of Louis XIII. became, many years later, the splendid palace of his son. The first three plates of the book consist of plans of the building and its surroundings, the last of the three, dated 1667, being a large scale plan showing the internal arrangement of the château and its dependencies (Fig. 2). The fourth and fifth plates, dated 1664, and entitled respectively "Veue et perspective du chateau de Versailles du costé de l'entrée" and "Veue perspective de chateau de Versailles de dedans l'anti-cour"; probably represent the building very much as it was soon after its completion, and before any considerable alterations had been made, by the architect Levau or his successor Mansart, either to the château itself or to its outbuildings.

* This volume can be seen in the Library of the Royal Institute of British Arch

With regard to the architectural treatment of the side elevation of the building there are, fortunately, still in existence various engravings published during the reign of Louis XIV. by which we are enabled to form a reliable opinion as to the measure of its success. One of these plates, engraved by Silvestre in 1664, entitled "Veue et Perspective du Chateau de Versailles du costé de l'orangerie" represents the south facade of the old building as forming a background to the small orangery, placed in a sunk court in the gardens and approached by two flights of steps from what is now known as the "parterre du Midi."

The architectural details of the inner elevations of the old building abutting on the marble court are shown by two engravings made by Le Pautre in 1676, one of which (Fig. 4) depicts a representation of Molière's tragedy of "Alceste" given, in the court itself, on the first day of the King's fetes at Versailles of that year. On this occasion there was no scenery other than that afforded by the three facades of Louis XIII.'s château, which were brilliantly illuminated with an immense number of lanterns and lamps.

These plates clearly depict the characteristics of the older work, of which the richness of the ornamentation of the lofty roofs, the highly decorated chimneys, the pedimented dormers, the curious excrescences, taking the form of angle turrets or balconies carried by quaintly designed corbels and crowned with small domes, and the treatment of the wall surfaces with their large panels, enriched with consoles supporting busts, are especially noticeable. When first erected the building had no projecting feature, other than the pseudo-portico of eight coupled marble columns, to break the continuity of design, and otherwise disturb the architectural repose of the small brick and stone facades: nor did the Doric columns, supporting balconies, of the end walls of the north and south wings, form part of the original design.

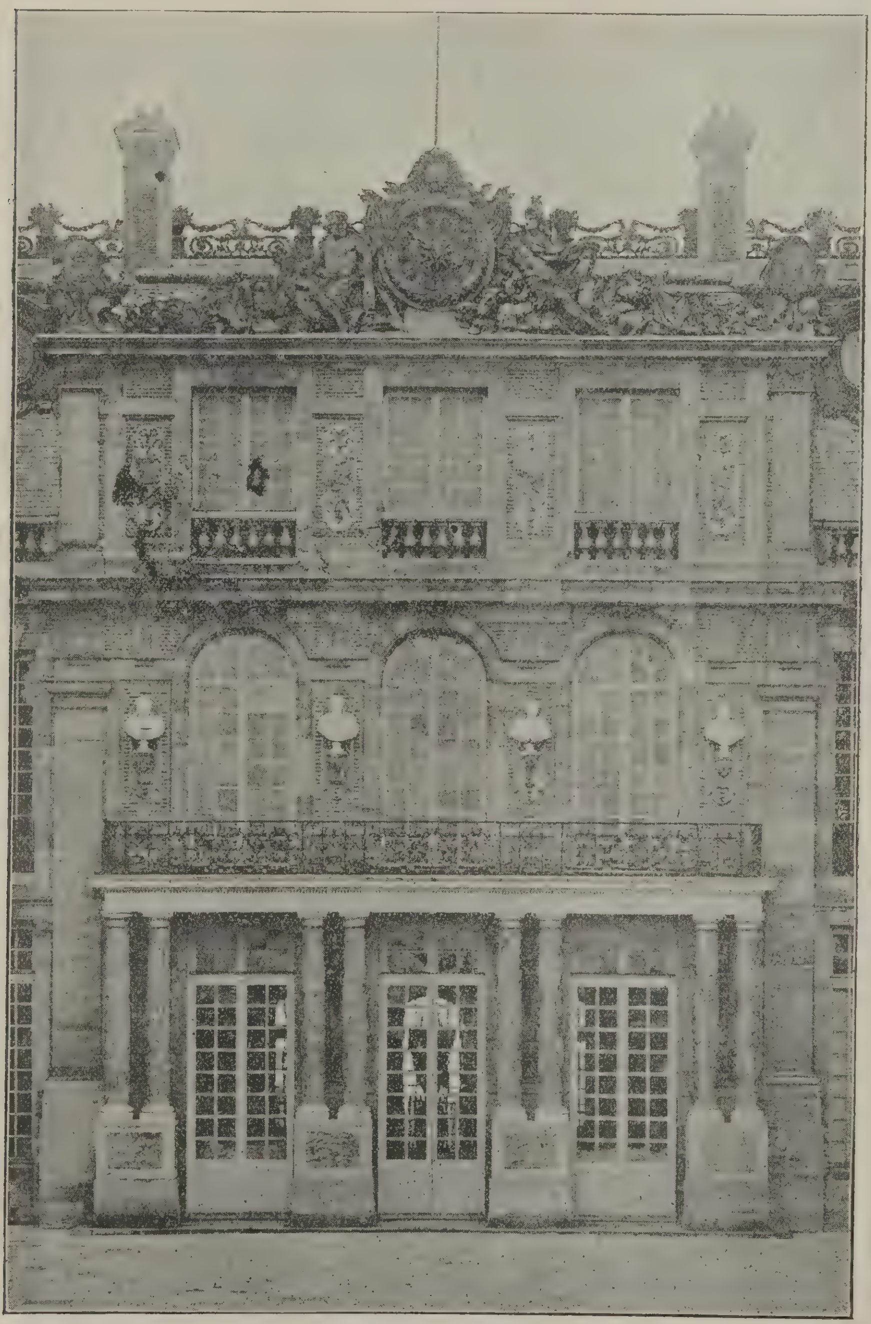


FIG. 3.—VERSAILLES: THE CENTRE PORTION OF LOUIS XIII'S CHATEAU AS IT IS TO-DAY (COUR DE MARBRE).

Notes on Competitions.

Sunderland Technical College Extension.

On the nomination of the president of the Royal Institute of British Architects, Mr. A. W. S. Cross, M.A. F.R.I.B.A., has been appointed to assist the committee in judging the merits of the various competitive designs submitted for the extension of the Technical College, Sunderland. The proposed extension comprises additional engineering laboratories and accommodation for a day training college.

Elementary School at Bootle.

In the competition for an elementary school for 1,000 children to be erected at Bootle, more than 180 designs have been submitted.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
Feb. 26	REBUILDING OF EBENEZER CHAPEL, GORSEINON. — £5 5s. offered for best plan: intending competitors to state their charges "for making out specifications and bills of quantities." Cost of work not to exceed £2,000. Particulars from Rev. D. H. Thomas, Gorseinon.
Mar. 7	SECONDARY SCHOOL AT LOWESTOFT.—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft. Deposit, 5s.
Mar. 13	SCHOOL AT FISHPONDS, BRISTOL for 600 children. Limited to Bristol architects. Particulars from W. A Adams, Secretary, Education Committee, Guildhall, Bristol.
May 31	EMERGENCY HOSPITAL AT ILFORD. —Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.

FIG. 4.—VERSAILLES: THE ORIGINAL CHATEAU AS SHOWN IN AN ENGRAVING BY LE PAUTRE (1676.)

Note: This view should be compared with the photograph reproduced on the opposite page.

FIG. 5.—VERSAILLES: FACADE OF ONE OF THE WINGS TO THE COUR DE MARBRE.

COUNTY COUNCIL SCHOOLS.

Notes on their Planning and Equipment.

At last Thursday's meeting of the Society of Architects, Mr. G. Topham Forrest, architect to the Northumberland Education Committee, read a paper on "County Council Schools: their general arrangement and method of building."

After recording the conditions prevailing in the average county school throughout England previous to the Education Act of 1902, Mr. Forrest went to consider practical conditions of detail affecting the council school architect of to-day.

The Central Hall: Pros. and Cons.

Council schools, he said, were now invariably planned either on the corridor or the central hall system. Recently the question had cropped up as to whether the advantages of a large hall adequately compensated for the additional expense involved in its erection. Some local education authorities seemed to think the provision of a hall was indispensable, while others had done away with it altogether. Personally, he favoured a large hall for schools of 300 and upwards, because it materially helped the ventilation of the class-rooms during the winter months: it acted as an air well, especially if one side had an external wall with large windows. A hall surrounded on all sides by class-rooms, however, was bad, as it was impossible to keep such a hall adequately ventilated except by mechanical means. The argument in favour of ventilating class-rooms through the central hall was that fresh warmed air could be admitted through both sides of the room over the radiators in the outside walls of the classroom, and through the screens dividing the room from the hall. Another advantage of the central hall was that the glazed screens between it and the classrooms helped materially in the lighting of these rooms. With regard to the disadvantages, the greatest was that of cost, especially in schools of one department of about 300 children, as it very often brought the cost up to £13 or £14 per head. When, however, more than one department had to be provided for, the expense was obviated to some extent by the Board of Education allowing one hall to be used at different times by the two departments.

Sanitary Conveniences.

Speaking of these, Mr. Forrest said that the popular position for the offices was in a corner of the playground, making it necessary for the children to pass outside in order to reach them. This arrangement was now only found in elementary school buildings. It had long since been abandoned in secondary schools. The regulation of the Board of Education insisting that the offices should be at a distance from the school building was all very well with the unsanitary "sanitary" arrangements of years ago: but with modern fittings it was unnecessary. So long as the closets were disconnected from the school building proper by a well-ventilated corridor, no possible danger to health could arise: he was very hopeful that in the near future the Board would amend their regulations, and so put an end to the hardship of sending children (especially the small ones) out from warm classrooms across an open playground in wet and cold weather.

FIG. 6.—VERSAILLES: DETAIL, COUR D'HONNEUR.

Cloakrooms.

All cloakrooms should be near entrances and have cross-ventilation. 12 ins. apart for cloakhooks was the distance allowed in secondary schools, and 6 ins. for elementary schools: yet, if 12 ins. was reasonable for the garments of the well-fed, surely 6 ins. was too little for the poorer and less-cared-for child. Reform here again was necessary.

Mats and scrapers should always be placed immediately inside cloakrooms, so as to prevent as much dust as possible getting into the school.

Mosaic floors, if properly laid, were the best, but ordinary cement concrete was quite satisfactory and much cheaper.

No school should ordinarily be built to accommodate more than 1,000 or 1,200 children in three departments. No single department should accommodate more than 400.

Planning.

In planning a school, attention should be concentrated first and foremost upon the arrangements of the class-rooms. As regards size of class-rooms, the tendency now was to reduce these as much as possible. It was very common to find schools with all the class-rooms of the same size, say to accommodate 60. Mr. Forrest thought this was a mistake: rooms should be graded: for instance, more children would be in Standard I. than in Standard VI.—therefore the former standard would occupy a room with accommodation for 60, while the older pupils would occupy rooms designed for 40 or 50. This was a good method, but based, of course, on the assumption that every class had a fully-qualified teacher and room to itself.

It was important to remember that the accommodation of every room depended not merely on its area, but also on the lighting, the shape of the room, and the position of the doors. Rooms should be planned as nearly approximating a square as possible, care being taken that sufficient width was left for the desks and gangways, as desks for elementary schools were all now made to a standard size, namely, 3 ft. 4 ins. for older children, and 3 ft. for infants.

Dadoes.

Glazed bricks or tiles had been the most suitable material for dadoes, on account of the small upkeep, but some authorities on school work had protested very strongly against the use of glazed surfaces for class-room walls: the reflected light on their surfaces might have something to do with it, and, being non-porous, they might not be considered hygienic for crowded rooms; this, however, was a matter of opinion; he personally favoured glazed bricks or tiles.

Warming and Ventilation.

For warming schools the ordinary fireplace could not be regarded as sufficient. Uniform warmth could never be obtained in a room heated by fires only, and a great evil of the open fire was the current of cold air continually passing along the

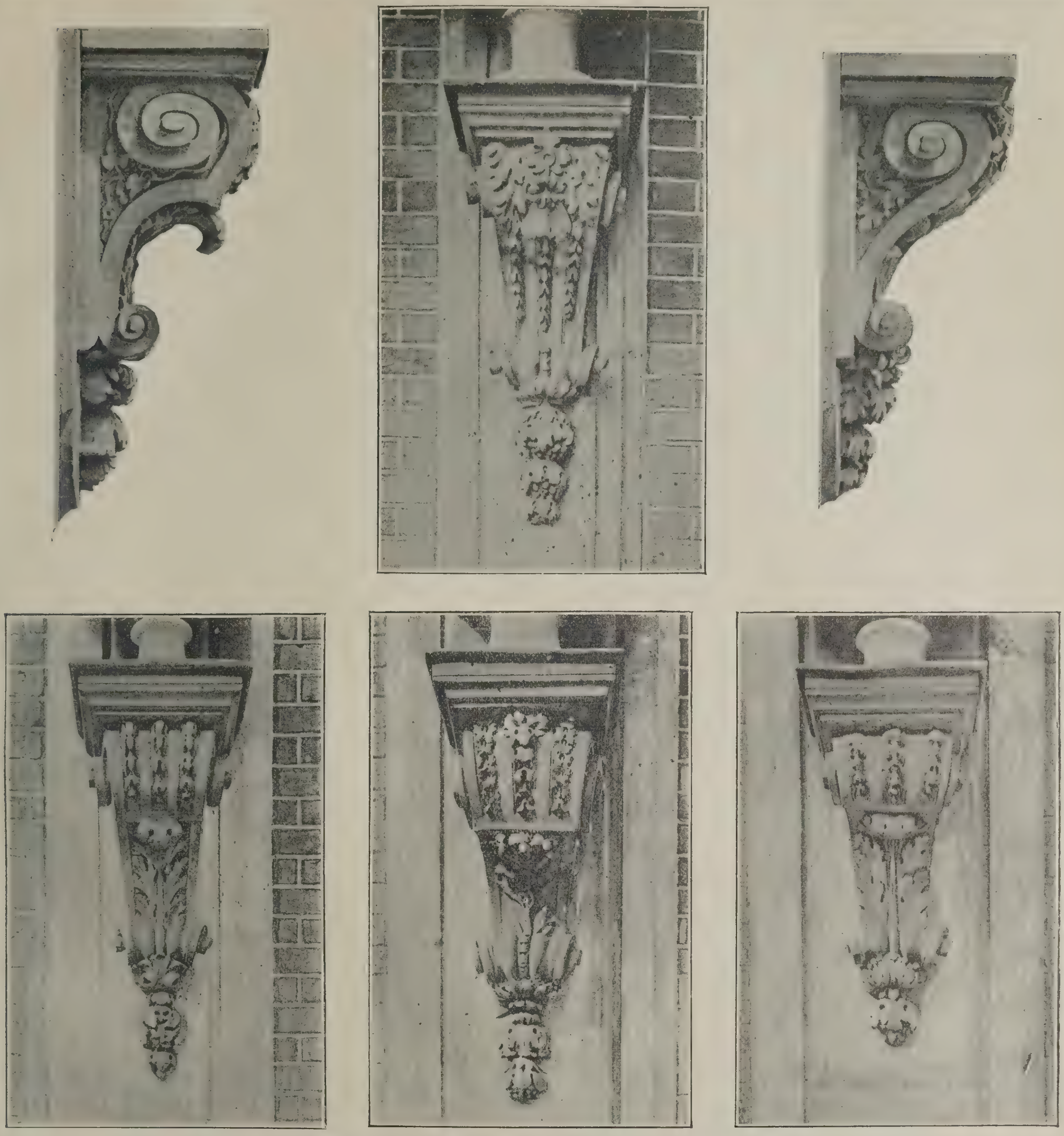


FIG. 7.—VERSAILLES: SOME CONSOLES FROM THE COUR DE MARBRE.

floor level, causing cold feet to the children. If open fires had to be put in, the following points should be attended to:—

(1) Firebrick should be used instead of iron.
(2) The fireplace should be narrower, with the back leaning forward.
(3) The space beneath the fire should be closed.

Ventilating grates were useful if no provision had been made for warming the cold air. Ordinary stoves, if not properly constructed, were a very dangerous form of heating, owing to leakage in flue pipes, and the consequent emission of the products of combustion into the room; but ventilating stoves such as "Musgrave's" or "Shorland's" gave very satisfactory results, though here again care in fixing was necessary.

Heating by hot water was one of the best and simplest means of warming schools. The low-pressure system was more prevalent, and one great thing in its favour was its adaptability to any method of ventilation. The practice of arranging hot-water pipes in channels below the floor, with perforated iron gratings at the floor line, was commonly met with, but should be condemned: it was dangerous, it tended to uncleanliness, and there was always a great loss of heating power. In connection with a low-pressure installation it was very necessary to see that the basement heating cellar was properly drained, with no risk of flooding after a heavy rain.

With regard to ventilation, Mr. Forrest said that the fresh air to a class-room should never be admitted through a single inlet, but should be relatively distributed to ensure proper diffusion. Personally, he was not an advocate of these fresh-air inlets. Let the whole area of the class-room window be made to open, let the window openings be large, and let the same be regulated by means of rod gearing, and at the end of every hour, or at every change of class, let the whole window be thrown open; the air in the room would then be quite fresh in less than five minutes.

Folding Partitions.

In supervising the fixing of folding partitions, there should be no large objectional trough or channel or any un-

sightly iron straps, and where a trough or channel was used such a channel should on no account be cut out of the wood floor or the school-room, but a straight board should be put down in direct line of partition with blocks, through which the maker of the screen should cut his own groove.

R.I.B.A.

Mr. Francis Fox on Foundations Divers, and the Grouting Machine.

A meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., the chair being occupied by the president, Mr. T. E. Collcutt.

After the minutes of the last meeting were passed and read, the hon. secretary announced the decease of three members of the Institute—Professor Meldahl, of Copenhagen, Elected Corresponding Member in 1876; Sir James Knowles, M.C.V.O., Elected Associate in 1853, and Fellow in 1876; and Mr. E. W. Monntford, Fellow.

A vote of condolence and sympathy with the widow and relatives was passed, and a suggestion made to have the collected drawings of Mr. Mountford exhibited during the session. Mr. H. D. Searles-Wood and Professor Beresford Pite also spoke in praise of the deceased member and his work.

Mr. Francis Fox, M.Inst.C.E., read a paper on "Foundations: the use of Divers, and the Grouting Machine," illustrated by lantern slides.

The author referred to the country's wealth in cathedrals, abbeys, churches, and similar monuments bequeathed to us by our ancestors, and to the obligation which rested upon us to preserve them for the use and delight of future generations. In effecting this, a system should be adopted that will not attract attention. The characteristics and features, the old stones with their cracks and deformations, with their weather-worn arrises and surfaces, and even the very moss, should, if possible, be preserved. Only stone that has perished should be replaced by new; walls that are cracked, or out of the upright, should be secured without the constituent parts being removed or renovated.

His object was to call attention to a method of repairing old walls at a minimum of cost, and with a maximum of strength. The ordinary method of pointing up with mortar a crack in a wall in no degree remedies the injury; the crack remains a crack, and its tendency to widen is by no means lessened. We had not the necessary appliances for "grouting up" until the late James Greathead invented the grouting machine for use in the construction of deep tunnels or the London tube railways. "Grout" consists of a mixture of cement, sand, and water; and when this is poured like cream into the cavities of a wall, the work is called "grouted up." Instances were cited where timely "grouting" had saved at trifling expense large railway bridges constructed to carry the heaviest express locomotives travelling at high speeds.

The grouting machine consists of an iron receiver or reservoir into which, by means of pumps, air can be forced under any pressure up to 100lbs. to the inch. This receiver is connected by a flexible tube to another portion of the apparatus called the "grouting pan," which is in fact a churn furnished with a handle and spindle to which are attached arms or beaters. The proper proportions of cement and water, and in certain cases sand, are then placed inside, the lid screwed down, and the contents churned up into the consistency of cream. This is now ready to be blown into the crack, the mouth of which on either side of the wall has meanwhile been plugged up to prevent the grout from escaping. The compressed air is then admitted to the grouting pan, and so soon as the necessary valve is opened the contents are discharged into the wall. All the loose particles of stone and the opposite sides of the crack are thus cemented together. The expense of grouting scarcely approaches one-fiftieth, or even one-hundredth part of the cost of pulling down and rebuilding.

The author described the application of the grouting machine to one of the ancient towers of the city of Chester, which was cracked from top to bottom and the various parts moving in opposite directions. The tower was first shored up to prevent collapse. The grouting machine was then applied, commencing at the base and gradually working upwards. By this means the cracks were filled with cement, and the walls turned into monoliths; all the bulging portions, the old stones, and worn surfaces were left untouched, thus preserving the artistic and archæological interests. Then the foundations were examined, strengthened, and underpinned. Telford's Bridge over the Dee showed serious cracks which had been satisfactorily treated by the grouting machine.

One of the most interesting applications of the grouting machine is that being carried out under the supervision of the author of the Paper at Winchester Cathedral. The architects, Mr. T. G. Jackson, R.A., and the late Mr. J. B. Colson, had found very serious subsidence in various parts, that in the presbytery amounting to nearly 2ft. 6ins. The outer walls and buttresses had gone seriously out of the perpendicular, while the beautiful groined arches were distorted in form and disintegrated in character, and alarm had been caused by the fall of some stone from the roof. The author described the results of the investigations as to the cause of the mischief. The foundations of the building were found to rest upon logs of beechwood, some of them partly decayed, laid upon chalky clay 6ft. in depth, beneath which was a bed of peat 8ft. 6ins. deep, and below that gravel and flints overlying the chalk. The pits sunk to get access to the foundations quickly filled with water from the adjacent river, and the work of making good the foundations had to be done in the first place by divers. These pits are absolutely dark owing to the water being thick with peat, and no artificial light is possible; consequently the whole of the work is done, not by sight, but by feeling. So soon as the peat is excavated the bottom is covered over with bags filled with concrete, carefully and tightly trodden in all round: these are then slit open and another layer of bags placed on the top. These again are ripped up, and so on for four courses in all. All the chinks and crannies between the bags are filled by hand with cement concrete lowered down in buckets. This mass becomes practically a solid rock and seals down the flood of water from the gravel, enabling the excavation to be pumped dry. Concreting is then continued, either in bulk or in block, until a considerable height is attained, and upon this blocks of concrete or brick in cement are carried up and tightly pinned to the underside of the old masonry constituting the original foundations of the cathedral. When all these excavations or pits are completed, the walls of the presbytery will be practically standing on a bed of rock, instead of on compressible peat. It has been ascertained that almost the entire cathedral stands on peat, which must be excavated. The south transept is over four feet out of the perpendicular, and cracks of the gravest character are found in all directions. The most serious fact is that the cathedral is sinking, owing to the further compression of the peat in those places whence it has not yet been removed. Tests applied show that movement is still taking place, except in those parts which have been underpinned. The author expressed the opinion that the cathedral is doomed, unless it is underpinned without delay.

Details were given of the employment of the grouting machine at the old Saxon church of Corhampton, near Bishop's Waltham. There were cracks in the building wide enough for a man's head to enter. The mortar of the walls had perished, and the ivy had penetrated the building in every direction. It was unsafe to examine the foundations for fear of bringing down the whole structure; consequently the grouting machine was applied all over the building. The walls were then underpinned, and the entire building saved. No trace of the cracks is now visible, and the walls are perfectly sound.

Holy Trinity Church, Hull—a fourteenth-century building—is the latest instance of the satisfactory application of the grouting machine. Considerable cracks had occurred in arches and piers, and masonry had fallen. The nave piers were 6 to 7 inches out of plumb, and the joints of shafts had opened on one side and crushed on the other. Investigation showed that the foundations were built on a timber raft of horizontal oak baulks crossing each other at right angles. The upper layer had rotted, and the lower layer was decaying. The masonry overlying this timber was cracked and flaked in all directions, and most seriously injured. The author gave a detailed description of the means adopted for saving the building, the first step being to set the grouting machine freely to work pumping or forcing cement into every cavity and crevice, and filling up the voids left by the decayed timber. To-day each pier stands on 624 square feet of solid concrete, instead of on the old defective foundations.

Another purpose served by the grouting system is the preservation of the old road bridges which form such picturesque features in the landscape. Owing to increased weight and speed of traffic, many of these bridges have had to be replaced by unattractive and more costly structures. By means of the grouting machine, however, they can be saved for a fifth to a tenth part of the cost of new ones, and can be made safe and strong enough to last another five hundred years. The author cited an instance of an old bridge in Westmoreland, which would have had to be destroyed and rebuilt, but which was made perfectly sound by the grouting machine at a cost of £50. The machine is playing an important part in the preservation of the celebrated "Auld Brig o' Ayr."

The author's opinion is that no objection exists against its wholesale adoption.

Mr. H. D. Searles-Wood proposed a vote of thanks to Mr. Fox for his papers, which was seconded by Professor Beresford Pite. Other speakers were Canon H. D. Rownsley, F.S.A., Mr. Hubbard, F.S.A., and Mr. Max Clarke. Mr. Fox answered briefly,

THE "OLD HOUSE," APSLEY GUISE, BEDS. (AS IT WAS).

CERAMICS IN ARCHITECTURE AND DECORATION.

On Wednesday last, at the Auctioneers' Institute, Mr. Walter Gandy, of the Royal Doulton Potteries, read a paper on "Ceramics in Architecture and Decoration." At the outset he gave an interesting sketch of the history of terra-cotta, dealing with Egypt, Chaldea, Babylonia, Assyria, Persia, Greece, and Italy. Attention was drawn to pottery work throughout the Roman empire, and especially to the remains of Roman ceramics in Britain, after which Mr. Gandy described the nature of Continental brickwork during the Middle Ages, and the methods of English architects from the Reformation to our own times. After the departure of the Italian designers from this country (caused probably by retrenchments in expenditure after the death of Henry VIII.) the use of terra-cotta for buildings practically ceased, until its revival in the nineteenth century. During that century the travelled amateur-architects of the day thought brick too mean a material for the grand style, and if stone could not be afforded, it must be imitated in stucco. Mr. Gandy gave an account of the establishment towards the close of the eighteenth century, of a small factory at Lambeth, where excellent terra-cotta work was done, and of the specimens of the work of the factory which could still be seen in various London churches. With the Great Exhibitions of 1851 and 1862 came a great revival in all the applied arts, and among them, in the use of terra-cotta. This brought the lecturer down to the present time, and, with the aid of lantern slides, he showed a wide range of ceramic effects in buildings for which Messrs. Doulton have supplied the materials. In unglazed terra-cotta, in faience, in saltglazed stoneware, in "Carrara" ware, in enamelled stoneware, and other less important branches of the manufacture, the firm of Doulton has been doing pioneer work in ceramics as applied to architecture. "Carrara" ware, said Mr. Gandy, was being extensively used in cities, as it was not affected by acids, it had a pleasant colour and surface, and could be easily cleaned.

AN ARCHITECTURAL DISCOVERY.

We give on this page two illustrations of a curious architectural discovery — a seventeenth-century house under nineteenth century stucco. For these illustrations we are indebted to the "World." By carefully comparing them, it is easy to see how the various features were covered up, and while it must be admitted that there is a certain sort of comfortable picturesqueness about the old house, with its climbers and odds and ends that relieve the surface, the general effect is hotchpotch; whereas the house beneath the veneer is a sturdy example of half-timber and brickwork. The unmasking of this hidden example of seventeenth-century domestic architecture was carried out a short time ago under the direction of Mr. W. H. Cowlishaw, architect, of James Street, W.C. The original house was H-shaped in plan, but at some time or another the central bay was added—in the writer's opinion, an unfortunate addition.

THE "OLD HOUSE" (AS IT IS) SHOWING ORIGINAL 17TH CENTURY FEATURES.

MR. HENRY T. HARE ON THE PLANNING OF PUBLIC LIBRARIES.

At the meeting of the Liverpool Architectural Society held on February 3rd a paper was read by Mr. Henry T. Hare, F.R.I.B.A., on "The Planning of Modern Public Libraries."

The gist of Mr. Hare's introductory remarks was that, considering so many competitions had been held for designs of public libraries, it might reasonably have been expected that so much thought and talent directed to what was really an easy subject would have resulted in some original type of design. This, however, was far from being the case, for not one design could yet claim to be the last word in library planning.

The subject really needed to be dealt with from the preliminary stages (especially as regards the selection of the site) under proper advice. If that were done a much more satisfactory result would be attained in most cases.

Lending Department.

Accommodation was often asked for in a moderately-sized district library for from 20,000 to 30,000 books in the lending department. This entailed the provision of a very large room, and was quite unnecessary, as so large a proportion of the books—especially fiction—quickly went out of date. Shelving for about half the numbers mentioned was usually ample for the average district, supplemented by an adequate room where books could be cheaply stored.

Reference Library.

The reference library was very often too large also. Accommodation for from 20 to 30 readers was ample for the average library, the greater part of the books being stored in a stack room adjoining the reference room.

Reading Rooms.

The reading room was capable of much improvement in its general treatment. It should be more in the nature of a hall, with considerable height—perhaps an open roof, thus obtaining better and freer air circulation. It should allow for the furnishings being widely spaced, so as to give ample gangways for people to move about without unduly disturbing the readers. (Mr. Hare here drew attention to an improved type of plan which he had prepared; in this he suggested that the lending department might be included in the reading room in an embayment, thus reducing the library to two main public rooms, namely, a combined reading and lending department and a smaller room opening out of it for reference readers; this did away with passages, entrance hall and staircases, and all available funds accordingly could be expended more on those portions of the building actually used by the public.)

He had also found in some instances that the lending library placed on the first floor did not work badly. He had adopted this plan in his library at Wolverhampton, where it was quite satisfactory.

"Open Access" or Indicator.

The adoption of either the "open access" or indicator system directly influenced the design of the building.

The necessity for direct supervision of the lending library in all its parts by the attendant from a central fixed point suggested at once a semi-circular form, with bookcases radiating from the counter, as the ideal plan for this room; on restricted and awkwardly-shaped sites, however, such a plan was difficult, if not impossible; moreover, radiating bookcases in a square room looked ragged, and were wasteful of space.

It was quite possible to exaggerate the importance of staff supervision, as the public using the library largely overlooked each other, and this, in Mr. Hare's opinion, was the most effectual supervision that could be got.

Juvenile Department.

In the new central and branch libraries he had designed for Islington, juvenile rooms had been provided near the entrances, with a self-contained portion of the room screened off 7 feet high for the juveniles' lending department. He thought all juvenile rooms should have an instructing attendant, who could explain any doubtful or difficult points which the children might come across in the books they were reading.

Lecture Room.

A new element had been introduced into the planning through the recent development in the direction of making libraries more useful as educational centres, where lectures could be given, and looking at the question from that point of view it appeared to be open to considerable doubt as to whether the familiar news room, with its expensive fittings, was actually a present-day necessity.

The Passing of the News Room.

In the new Islington libraries referred to above he had not provided news rooms, but only large general reading rooms for magazines and periodicals. Consequent on the omission of the news room, it became necessary to make provision for the inspection of the advertisements in the daily papers by those seeking employment, and this need had been met in an admirable way. The situation advertisements were cut out and pasted on slats, which were then strung by leather thongs on brass rods, padlocked at ends, and placed along the walls of the entrance hall. The entrance hall only was opened for the inspection of these from 8 to 10 a.m., when they were removed to permit of the general opening of the building.

Reverting to the need for the provision of lecture rooms, Mr. Hare said they should be so arranged as to be able to be used independently of the library, with separate entrances and exits, and means for shutting off the other portions of the building. There should be a platform at one end, provided with a lantern screen, and retiring rooms, and a small room at the other end of the hall opposite the platform for a cinematograph, with a hole for lens through the wall, so that the danger of fire would be reduced to a minimum.

Floor Construction.

Speaking of flooring, Mr. Hare said it was generally essential that it should be as fire-resisting as possible. There were many patent systems of "fire-proof" floors being hurled at architects just now, each of them better and cheaper than any other, but for his part he had found from experience that the old-fashioned simple floor of steel joists and concrete was best, with a cement finish on top and covered with cork linoleum laid in mastic; this made a floor as fire-and-sound-proof as was necessary.

Heating and Ventilation.

An arrangement of heating by hot-water pipes on the low-pressure system was preferable. The pipes should be carried round under the bottom shelf of the bookcases, which should be at a height of 18 ins. above the floor, this pipe space being insulated by "Uralite" or some other non-conducting material, and protected in front by open-pattern metal gratings in easily removable sections about 3 ft. long.

Inlet ventilation was best secured by fresh-air inlets at intervals behind the heating pipes, supplemented by opening parts of windows, while outlet ventilation was best secured by exhaust trunks in the roof, with air-pump ventilators, assisted by electric fans.

Furniture.

The bookcases should not be more than 8 feet high, so that the top shelf could be reached by the ordinary person without the use of steps.

All furniture and fittings should be in hardwood. The initial cost was heavier, but a better appearance was obtained, and an ultimate saving in up-keep, as they did not require painting annually.

In conclusion, Mr. Hare said that the whole subject of the arrangement of libraries on "open access" or "indicator" systems was not really one for architects at all, but was a battle to be fought out amongst librarians themselves.

He pointed out the desirability of ~~broadening our views~~ as to the necessities of public libraries in the nature of a much simpler style of building than that now in vogue, with quiet but dignified architectural treatment of a public character.

Discussion.

A vote of thanks was proposed to Mr. Hare by Mr. John Woolfall, F.R.I.B.A., seconded by Mr. W. E. Willink, F.R.I.B.A., and carried with acclamation. A general discussion then ensued, the chief points raised being:—

(1). As to the provision of public sanitary conveniences in libraries;

(2). As to the nuisance of loafers looking out of windows; and

(3). As to the provision of a bookcase on the lending library counter for the display of the newest works of fiction.

In acknowledging the vote of thanks, Mr. Hare replied to the points raised in the following terms:—

The idea of placing public conveniences in libraries had been exploded long ago. In his opinion, unless the authorities concerned were prepared to keep attendants for each sex constantly in the conveniences, they should on no account be provided, as they all knew only too well the possible state of misuse into which the conveniences otherwise became. He did not favour them inside the building, in any circumstances; if required, they should be provided outside.

With regard to the second point raised, the remedy was quite simple, namely, to raise the sills to a height of about 6 feet to the glass line, which, indeed, was the ordinary practice.

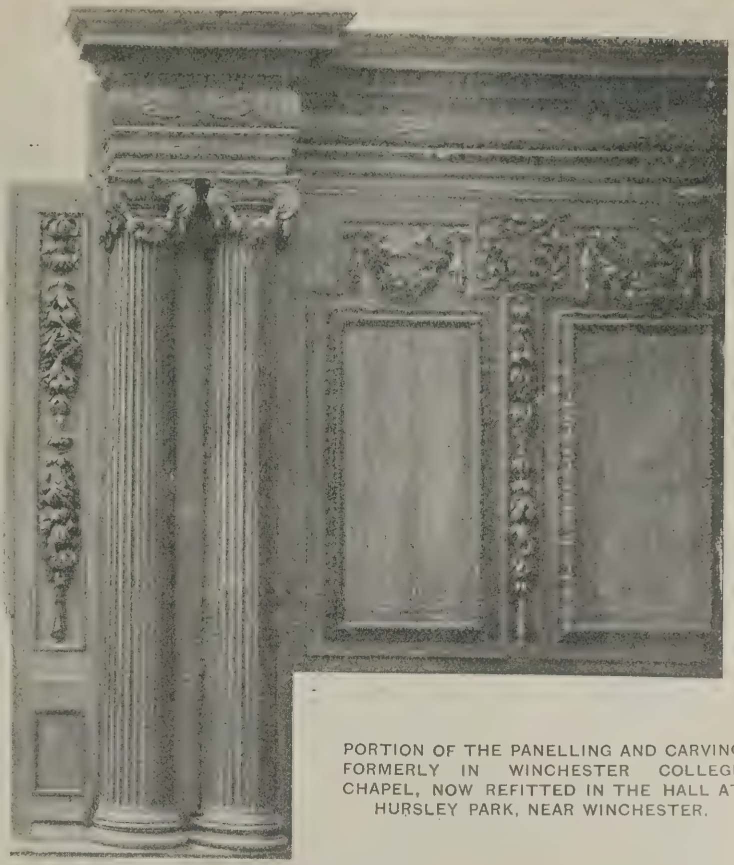
Finally, with reference to the provision of a bookcase on the counter for the display of new works of fiction, it was the custom of one librarian he knew to provide this case with an open wire front to the public side, and an open back on the attendants' side, so that the intending reader pushed his finger through the wire screen on to the book he required, which was thus pushed out at the back, and the attendant seeing the book pushed out in front of the others, reached it down, entered it up, and passed it over the counter to the reader.

The lecture was illustrated by means of drawings of many well-known libraries designed by Mr. Hare, in addition to some valuable large-scale drawings of fittings and furniture.

THE GRINLING GIBBONS CARVING FROM WINCHESTER COLLEGE CHAPEL.

At the meeting of the Royal Institute of British Architects held on February 3rd a very fine piece of carving by Grinling Gibbons was exhibited, and is still on view in the library at 9, Conduit Street, W. It represents the arms of Winchester College, and formed part of the screen which was removed from Winchester College Chapel years ago by Butterfield, and is now refitted as panelling to the hall at Hursley Park, near Winchester. The work of restoring the screen was entrusted to Messrs. H. H. Martyn and Co., of Cheltenham.

The piece of carving has been lent to the Institute by Mr. George Hubbard, F.S.A., F.R.I.B.A., who, in a letter published in the Institute "Journal" for February 8th, says:—"The carving at Winchester College was executed by Grinling Gibbons in the year 1660. Perhaps a few words in connection with this interesting work may be acceptable. I quote from a letter in my possession, dated February 15th, 1898, written by the Bishop of Southwark to Lord Heytesbury, in which the Bishop makes the following remarks:—'During the Great Revolution the College Chapel was much mutilated, but on the Restoration its panelled work was erected, in severe taste, but by the best procurable workmanship, and there it remained the glory of the place, until the Gothic craze possessed the authorities, and it was turned out about 1865, and passed into my hands.' Prior to its removal, the chancel of the chapel was richly panelled with an abundance of Grinling Gibbons' carving. The east end was further embellished by four three-quarter pillars with Ionic caps, with swags, and between the pillars was a painting of the Annunciation, by Lemoine."



PORTION OF THE PANELLING AND CARVING FORMERLY IN WINCHESTER COLLEGE CHAPEL, NOW REFITTED IN THE HALL AT HURSLEY PARK, NEAR WINCHESTER.

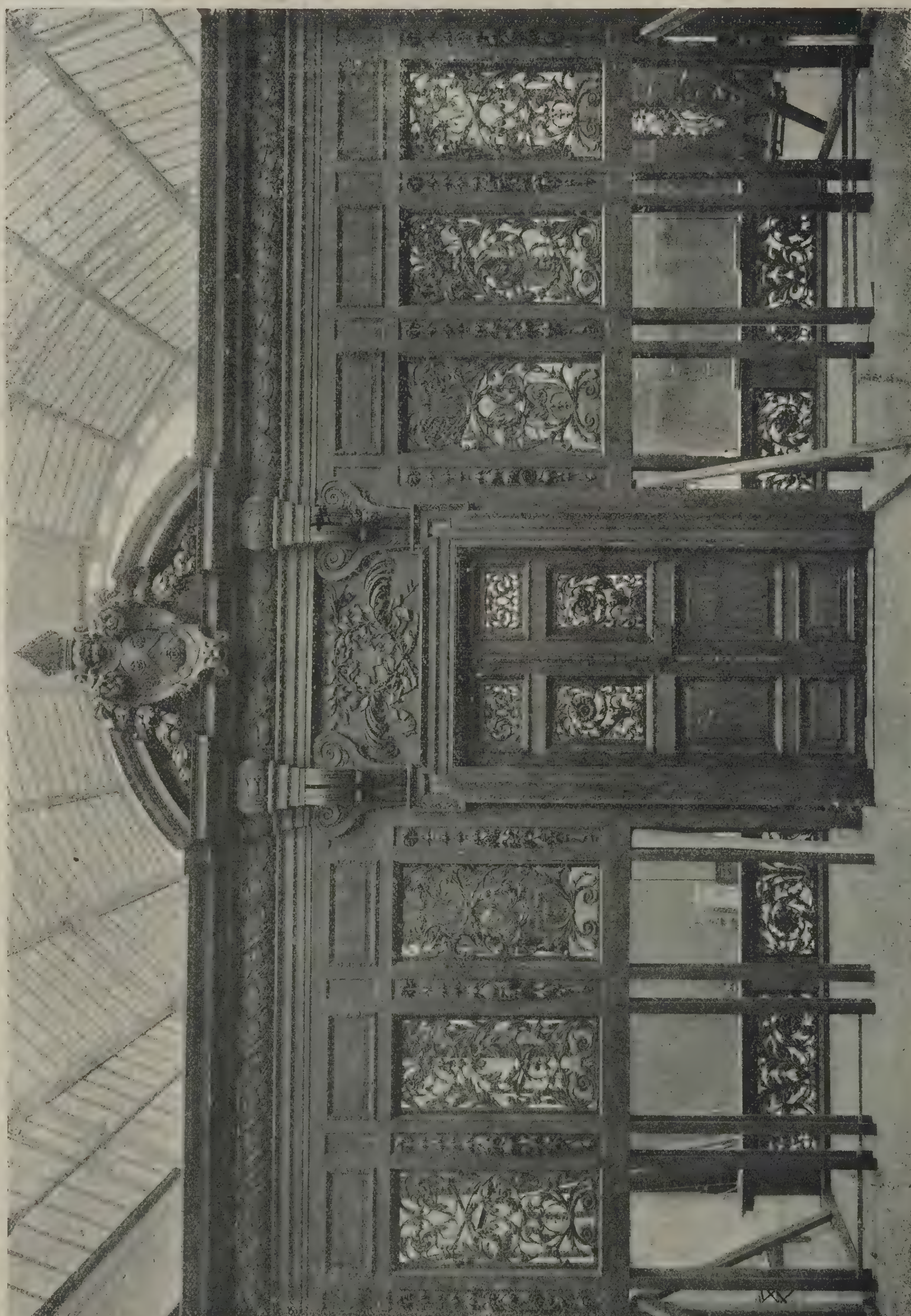
We quite agree with Mr. Hubbard that whilst it would be unfair to judge the action of our predecessors by present-day standards, yet it is a matter of extreme regret that this beautiful example of the genius of Grinling Gibbons should have been discarded by Mr. Butterfield and the Governors of Winchester College, 43 years ago.

The subsequent history of this panelling is as follows:—Originally sold by the authorities of Winchester for £50, it was purchased, in 1898, by the late Lord Heytesbury, by whom it was sold to Messrs. Hubbard and Moore, who in turn disposed of it to its present owner, Sir George Cooper, of Hursley Park. The beautifully-executed coat of arms which formerly enriched the centre pediment of the ante-chapel screen, however, still remains in Mr. Hubbard's possession. (For the illustration of this coat-of-arms and for the detail of the upper wall panels and cornice on page 163, we are indebted to the editor of the R.I.B.A. "Journal.")

If much of the charm of this old-time carving is due to the faithfulness with which natural subjects have been so carefully and delicately reproduced, its value is certainly greatly enhanced by the fact that now, in its old age, it presents a silvery greyness of tone which is almost unique among existing examples of its class.

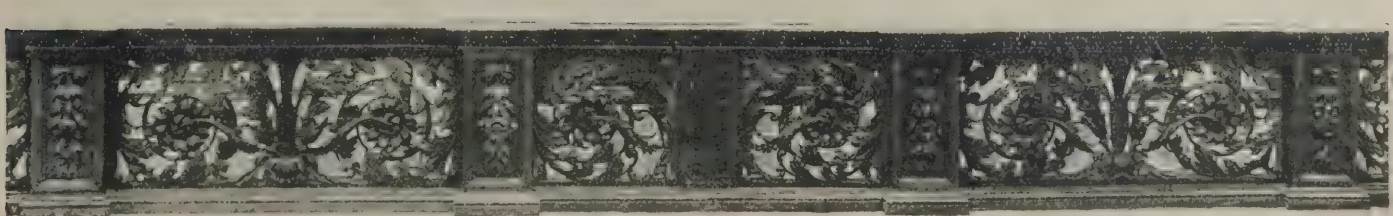
THE ARMS OF WINCHESTER COLLEGE (GRINLING GIBBONS CARVING), FORMERLY IN WINCHESTER COLLEGE CHAPEL, NOW EXHIBITED IN THE LIBRARY OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

The view of the screen on the next page shows the arms in their original position



SCREEN FORMERLY IN WINCHESTER COLLEGE CHAPEL, NOW REFITTED IN THE HALL AT HURSLEY PARK, NEAR WINCHESTER (GRINLING GIBBONS CARVING)

DETAIL OF UPPER WALL PANELS FORMERLY IN WINCHESTER COLLEGE CHAPEL.
(GRINLING GIBBONS CARVING).



ALTAR RAIL FORMERLY IN WINCHESTER COLLEGE CHAPEL (GRINLING GIBBONS CARVING).

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

Sound-Proofing Buildings.

LONDON. — W. writes: "As a Continental architect staying here to study the architectural works of your country, I shall be glad to know of a publication relating to the means applied to make walls sound-proof. I realised that the American skyscrapers were rather effectively built in this respect, and think that the Americans must have a way of their own to attain this result."

Much useful information as to American methods of construction may be gained from "Building Construction and Superintendence," by F. E. Kidder, published by W. T. Comstock, of New York, copies of which may be obtained from Mr. B. T. Batsford, 94, High Holborn, W.C. The general adoption of cavity systems, both in walls and floors, is largely responsible for the sound-proof character of good American construction. In timber buildings "deafening" is used with similar results.

Stability of Wooden Roof Truss.

PRESTON.—NOUVEAU writes: "I should be pleased to have your opinion of the stability of the roof truss and buttresses shown on tracing (not reproduced). Are the thick buttresses strong enough to resist the loads and stresses upon them? I am anxious to dispense with the iron tie-rods in principals, but am afraid this would be impracticable and unsafe with this type of principal. Would the same truss be safe without tie-rods, if the span is reduced to 42ft.?"

The calculations in wooden trusses of this kind are very awkward owing to the fact that many stresses are indeterminate, and several assumptions have to be made. One of the most satisfactory ways of ascertaining the stability of the buttress is to proceed as follows: Taking the weight of the truss as 160-cwts., and the wind-pressure as 135-cwts., each reaction, assuming each buttress to give equal resistance, comes about 136-cwts. at the inclination shown (Fig. 1, in which the full lines indicate the effective truss for obtaining the stress diagram shown). Taking the wall and buttress together, the combined weight for one truss comes at about 686-cwts., and this resultant weight acts down the line GG, Fig. 2. Combining this with the reactions, by taking RQ, R'Q', to represent the weight of wall and buttress, and QS and Q'S' the reactions to the same scale, the two lines RS and R'S' represent the resultant lines of pressure for the wind on either side. We see that the line of pressure comes just outside the section, and so the walls should be thickened, or the buttresses increased in size. The stresses in the truss itself cannot be calculated exactly. The stresses due to bending at the portions AA (Fig. 1) make these the weakest parts, and they should be strengthened. If it is desired to preserve the same form of truss, this could perhaps be effected in the most simple manner by bolting 6in. by ½in. iron plates between the points AA, as indicated on Fig. 1. I would not advise the omission of the tie-rod, even though the span be reduced to 42ft. Without the tie the thrust on the buttresses would become greater, and there would also be some more severe bending stresses on the truss

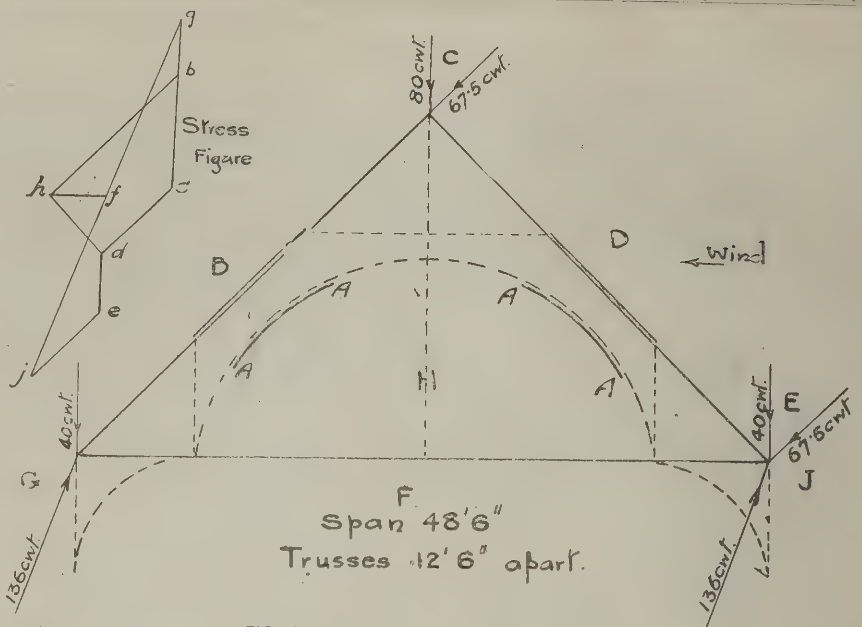


FIG. 1.—STABILITY OF ROOF TRUSS.

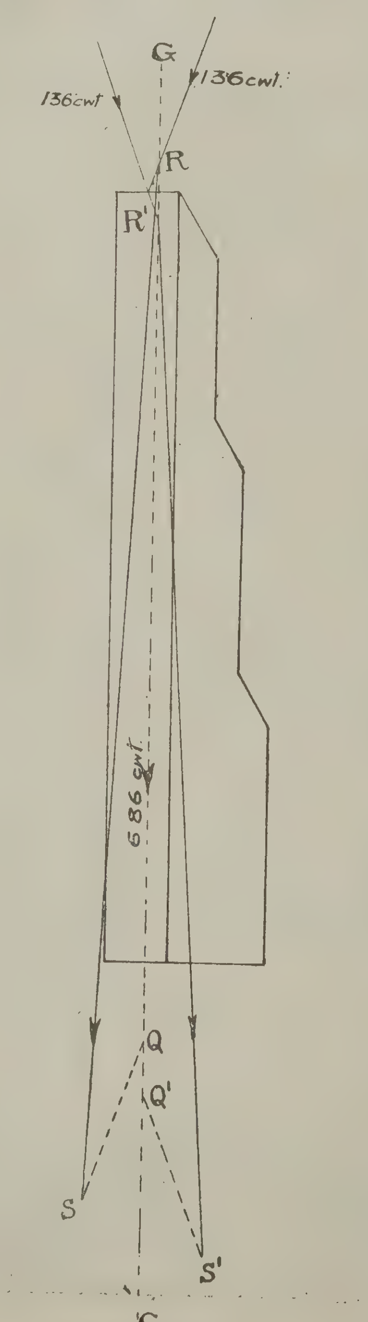


FIG. 2.

itself. If it is really necessary to avoid the tie, the truss could be strengthened by bringing the collar-beam lower and extending the hammer beam to bring the arch farther from the principal rafter, and so strengthen the weak section. The distance between trusses could also be lessened to reduce thrust. Space prevents fuller details being entered into, as there are very many points to consider. Some useful notes on the stresses in collar-beam and hammer-beam trusses will be found in Cassell's "Building Construction." A.

Pressed Wood Carving.

BARNSTAPLE — S.E. writes: "Can you refer me to a firm from whom cheap pressed wood carvings (deal) can be obtained?"

Try the Wood Carving Co., Ltd., Windsor Street, Birmingham.

Buildings to Measure near Leicester and Loughborough, and in Durham.

LEICESTER.—POSSIN writes: "I shall be glad to know of a good example of Gothic in the neighbourhood of Leicester and Loughborough suitable to measure for the R.I.B.A. final examination. I am afraid all the Leicester churches have been done, more or less."

It may be taken as a general rule that if a church is measured up much by students the example must be a good one and well worth your while to measure also. The better the example you measure, the more instructive will it be to you. At Desford there is a good Perpendicular church. There is a small church at Kirby Muxloe, and the remains of a slightly fortified manor-house dating from the time of Henry VII. or VIII. A fine Decorated and Perpendicular church stands at Sileby, and churches of less importance will be found at Wanlip and Thurcaston. At Loughborough, the church of All Saints was built in the fifteenth century and restored by Sir Gilbert Scott. The front of Garendon Park, which stands a mile and a half north-west of Loughborough, is Elizabethan. Churches will be found at Prestwold, Wyneswold, East Leake, and Wysall. M.

SUNDERLAND.—A.S. writes: "Kindly let me know of a building suitable to measure in the county of Durham."

Here is a list of the more important buildings. The portions of these build-

ings which are most suitable for measuring are not given, as this is a matter for your own selection, and depends upon the time and means at your disposal:—*Early English work*: Chapel of the Nine Altars in Durham Cathedral, the churches of Sedgefield, St. Andrew's, Aukland, and portions of the churches of Ryton, Medomsley, Easington, Chester-le-Street, Lanchester and Boldon, and Tinchale Priory. *Decorated work*: Windows at Brancepeth, Houghton-le-Spring, Darlington and Easington, alterations at Tinchale Priory, the gateway of Kepyer Hospital, Durham, and windows in the nave of Durham Cathedral. *Perpendicular work*: Altar screen and bishop's throne at Durham Cathedral, parts of the Palace at Bishop Auckland, and parts of the churches at Staindrop, Chester-le-Street, Darlington, Houghton-le-Spring, Brancepeth, Sedgefield, Billingham, Boldon, Easington, Hartlepool, Pittington, Lanchester, Heighington, Coniscliffe, Medowsley, Dalton-ton-le-Dale, St. Edmond's, Gateshead. There is some fine Norman work in the cathedral and castle at Durham, and in the churches of Norton, Heighington, Pittington and Lanchester. Saxon work will be found at the churches of Escombe, Norton, Monkwearmouth (A.D. 674), Jarrow (A.D. 685), and in the crosses to be seen at St. Andrew's, Aukland, Aycliffe, and in Durham Castle.

M.

The Temple Gateways.

LIVERPOOL.—D. G. Mc.I., sends the following in further reply to "X's" enquiry in our issue for January 29th.—"There do not appear to be any published drawings of the above gateways (with the exception of a measured drawing of that to Middle Temple Lane, which appeared in Vol. 7, series 3, of the "Architectural Association Sketch Book."). The following description therefore may be of service:—The entrance gateway to Middle Temple Lane was designed by Sir Christopher Wren and erected in the year 1684, the site having been previously occupied by a gateway bearing the Arms of Cardinal Wolsey; this gateway was built at the cost of one Sir Amyas Paulet, whilst he was the Cardinal's prisoner, in the hope of appeasing the prelate's displeasure, and so obtaining his freedom. The gatehouse to the Inner Temple is still a curious old building adorned with the Feathers of Henry, Prince of Wales. The house is known as No. 17, Fleet Street, and bears an inscription declaring it to have been the palace of Henry VIII. and Cardinal Wolsey, but it was really built in the reign of James I. for the purpose of housing the Chancellor and officials of the Duchy of Cornwall. Afterwards it became "Nando's," a coffee-house of note. The gateway consists of a bold semi-circular arch, flanked by heavy pilasters, the whole bearing heavy panelled and enriched rustications, voussoirs, and corbels. The sides of the gateway are adorned with the Arms of the Inner Temple, as that of the Middle Temple is, with the Lamb bearing the Banner of Innocence and a red cross, which was the original badge of the Templars. Here the shields bear a horse, representing Pegasus, with the Latin inscription: *Volat ad astera virtus*; but when the emblem was first selected it consisted of a horse with two riders, intended to represent the poverty of the Templars. The men gradually became worn away in course of time, and, on the shield being restored, their remnants were mistaken for wings, hence the winged horse. The freehold of the building was acquired by the London County Council, in conjunction with the Corporation of the City of London, about four years ago, and the building and gateway were subsequently "restored" under their direction, when the historic gateway was removed and set back 5ft. from its original position, in order to widen the footpath. The gate-house contains some most interesting work in its upper rooms, especially in the council chamber of the Duchy of Cornwall. The notable ceiling of this room, and its rich oak panelling, were restored from the suggestions supplied by Sir Caspar Purdon Clarke, the work being done in the workshops of the Science and Art Department, South Kensington, at the time of the general restoration."

Articles on Reinforced Concrete System.

MANCHESTER.—P. writes: "Kindly state in what issues the earlier articles of the series on Reinforced Concrete Systems appeared."

The articles on "Systems of Reinforced Concrete" which have appeared in our columns are as follows:—

1. The Columbian System, May 23, 1906.
2. The Hennebique System, June 20, 1906.
3. Expanded Metal, July 18, 1906.
4. The Coignet System, August 15, 1906.
5. The Johnson Indented Steel Bar, September 12, 1906.
6. Homan and Rodgers' System, Oct., 1906.
7. Johnson's Wire Lattice, November 7, 1906.
8. Broad-Flange Beams, December 5, 1906.
9. Potter's and Edwards' Systems, Jan., 1907.
10. Hodkin and Jones' Corrugated Bar, January 30, 1907.
11. William Lindsay and Co.'s System, February 27, 1907.
12. The Kahn Trussed Bar, March 27, 1907.
13. The Kleine System, April 24, 1907.
14. The National Fireproofing Co.'s Systems, May 22, 1907.
15. The Wells System, June 19, 1907.
16. The Weber System, July 17, 1907.
17. The Siegwart System, September 11, 1907.
18. The Somerville System, November 6, 1907.

Acetylene for Cooking and Heating.

A.S. writes:—"Can acetylene gas be used for heating and cooking purposes, like coal gas?"

In reply to the above, Messrs. Strode and Co., of 48, Osnaburgh Street, Regent's Park,, N.W., state:—We supply a large number of acetylene gas cooking ranges, boiling rings, and heating stoves, all of which can be thoroughly relied upon to give satisfactory results. There are a number of cheap stoves on the market which have the serious defect of lighting back. All our burners are constructed on scientific principles, which provides for a proper mixture of air and gas, and there is no danger of the burners in our stoves lighting back.

Beaulieu Abbey.

WOLVERHAMPTON. — D.H. writes:—"I should be glad to have a short description of Beaulieu Abbey, the present state of the ruins, and if any part of it is still used for divine services."

The abbey is entered through a gate-house now called the Palace House, which gives access to a groined apartment of Decorative character. In the upper rooms there is some good panelling of the time of Henry VIII. Remarkable grotesque beads decorate the string-course externally. Of the abbey itself, the most important part remaining is the refectory, now used as the parish church (St. Bartholomew's). It is late Early English in style, but unfortunately the roof has been lowered, and an unsightly buttress has been built against the south wall. The lighting is obtained from five lancet windows. The pulpit was originally used by the monastic reader. In the south doorway there is some ancient ironwork. The north door of the refectory opens into the ruined cloisters. The three arches on the east side indicate the entrance to the chapter-house. The monk's dormitory was above the refectory, and the stairs descending into the south transept are still to be seen. Near the refectory door are the remains of the lavatory. Seven large arched recesses in the west wall have been monks' cells. Much of the original paving remains. Along the west wall of the cloisters is a long range of buildings with rafted sub-structure, and above the dormitory of the hospiture. Two doors in the outer wall of the cloister open into the church, the foundations of which have been very carefully traced by a late vicar, the Rev. F. W. Baker, but practically none of the superstructure exists to-day.

H.Y.M.

Quantity Surveyor's Report.

ENQUIRER writes:—"I shall be glad if you can tell me whether any book is published dealing with the subject of "Reports," as required in the examination of the Quantity Surveyors' Association."

So far as I am aware, there is no book published on "Reports." A candidate is merely required to write a descriptive report, based or not on actual fact—at his discretion, on some subject set by the examiners, who will give favourable consideration to a well-expressed and business-like style.

All Hallows, Barking.

Referring to the list of buildings to measure around London, given in our issue for January 29th, A.R.C.E., Forest Gate, writes:—"All Hallows Church, Barking, is stated to be in Essex. This is not so; it is by the Tower, opposite Mark Lane Station, and was called "Barking" because it was originally in the gift of Barking Abbey."

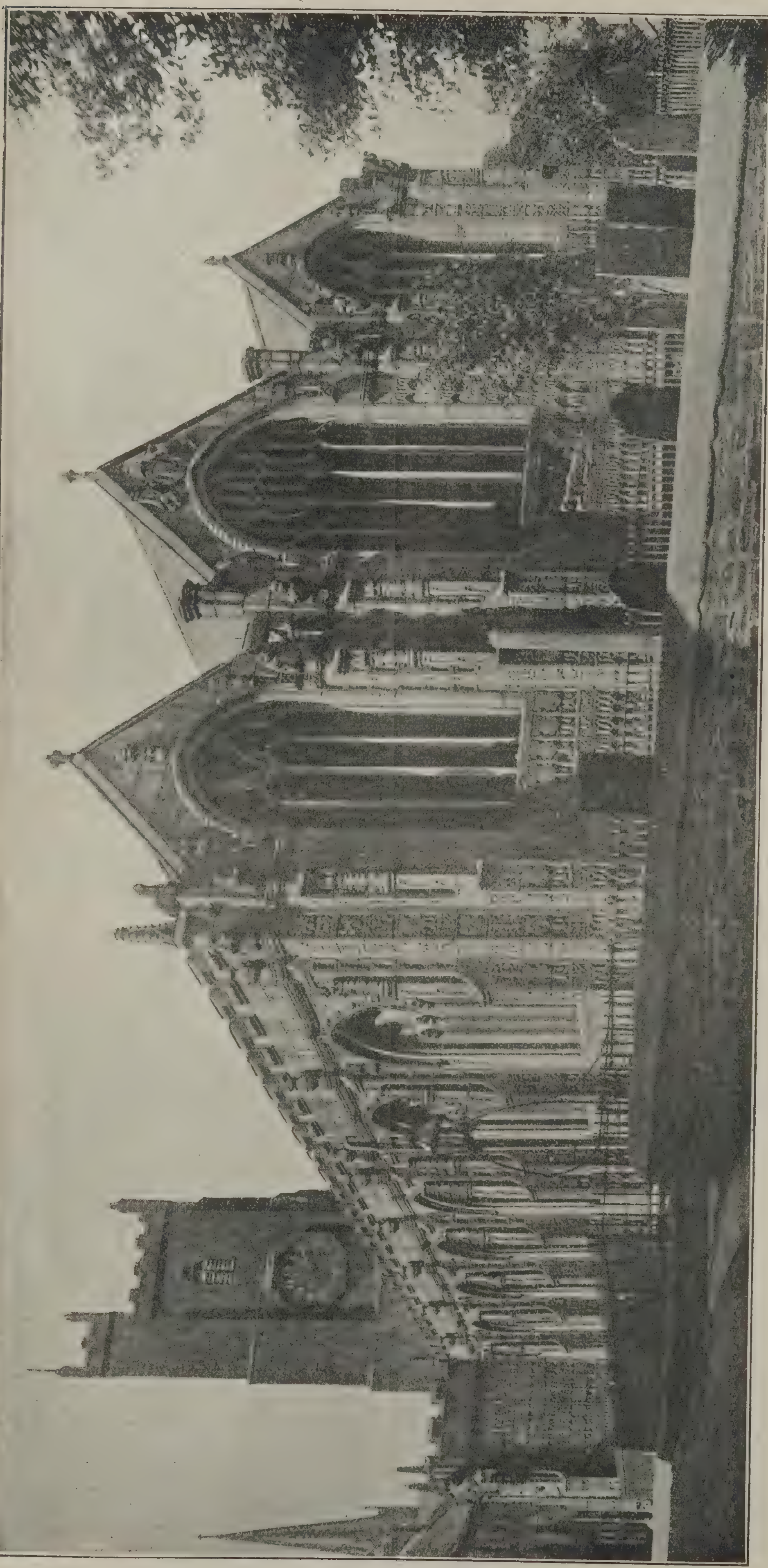
West Bolden Church, Sunderland.

S. writes:—"Please give me some information about West Bolden Church, near Sunderland, such as the date of the original structure, and the dates and nature and extent of the various alterations and additions."

The church of St. Nicholas, Bolden, is a particularly interesting specimen of Early English architecture, the tower and spire being of somewhat peculiar design. As compared with work of the same period in the more southerly parts of England, the proportion of the building might be called stunted, yet it is singularly in keeping with the landscape in which it is set. This church has been restored. There seems to be no record giving the dates of the various portions, but enquiries at the chapter treasury at Durham might very possibly reveal some document giving the exact information you require. There are three copies of an invaluable record of Bolden and district, called "Bolden Buke," which was complied in 1180 for Bishop Pudsey. One of these is kept at the chapter treasury at Durham. The list of buildings in Durham, given in last week's issue of this journal, will interest you.

H.Y.M.

AN EXHIBITION OF MODEL COTTAGES similar to that held at Cleveleys, Blackpool, is being arranged for on land near Ainsdale Station, Southport.



ST. MARY MAGDALENE'S CHURCH, LAUNCESTON: A GOTHIC EXAMPLE OF GRANITE WORK.

ARCHITECTURAL GRANITE.

The use of granite for the construction of buildings has been much more extensively favoured in the last few years in important cities than it was formerly. Of course, in such places as Aberdeenshire, where towns are situated close to granite quarries, it is only to be expected that such an extremely handsome and lasting material should be favoured over all others, and that it should be a *sine qua non* that any important building must be built of granite, but the use of granite has in the past been practically confined to districts in the immediate neighbourhood of granite deposits. It is strange that this should have been so up to within the last few years, because architects have long been accustomed to bring stone from great distances for important buildings. Indeed, we can go back and refer to Sir Christopher Wren obtaining Portland stone for St. Paul's Cathedral, and still further back to the use of Caen stone in Westminster Abbey and many other cathedrals and churches in England. We could go on enumerating instance after instance of historical buildings which have been built with stone derived from sources far more foreign to the locality in which the building is situated than the nearest deposit of granite would have been.

The Egyptians, of course, as we all know, favoured the use of granite, preferring it to all other materials for their choicest work, more especially decorative sculpture Egypt was one of the oldest civilised countries in the world, and its architecture was carried to a highly developed state. The Egyptians were the fortunate possessors of some fine granite deposits, which could be fairly easily worked and the material easily transported to the lower and richer portions of Egypt which afforded the opportunities for its employment, by reason of their command of labour. The climate of Egypt is such that materials are preserved for ages which would in our climate decay in perhaps 50 years. In using granite, then, the Egyptians did not need to consider the great durability of the material as a reason of its employment. To us the durability is perhaps the greatest argument for its use, but it was favoured in Egypt because of its hardness, its appearance, and its strength, qualities which led it to be looked upon as a valuable material worthy to be used for monuments.

The architect of that day had a greater command of labour than we have and no expense was spared; commercial consideration weighed with him to a very small extent. That the tradition of granite was not handed on and more efforts made to use the material in the middle ages and later is, of course, due to the fact that regard had to be paid to economy of labour. Architects were, from want of experience, naturally inclined to overlook the material and it was no doubt this reason that led to it being practically ignored until the last few years. The training of the architect leads him to study buildings of stone and brick, which are in such profusion, and unless he resides near granite quarries, he obtains no knowledge of granite and seems to have no inclination to use it. The last few years have, however, set a fashion and it is to be hoped that no longer will granite be overlooked for building purposes as it has been. The first persons that seemed to have recognised its possibilities were en-

gineers, who had found that its great hardness and strength were qualities that rendered it particularly fitted to the construction of heavy masonry, such as in bridge work, harbours, dams and breakwaters. The finest architectural displays of granite work we have in London are the Victoria Embankment, Waterloo Bridge, and London Bridge—all engineers' works.

Detailing Granite Work.

It is not necessary to study any new methods of construction in granite work. The science of masonry is practically the same in connection with granite as with stone. The jointing is much the same. There are a few small differences which it is advisable to adopt, but if granite is detailed exactly the same as stone, it gives as good, if not better results than stone. It seems to be an ingrained opinion among many architects that granite must be detailed flatly, such as the low relief work of the Egyptians. They think that, even if this is not a necessity of the material, it is the only economical way to work granite. But this is a mistake; it depends upon the kind of granite. A fine even grained granite, like Norwegian, is just as capable of being worked with fine mouldings as any stone is. It is, of course, somewhat more economical, just as with stone, to keep the projection and intricacies of mouldings and carvings as slight as possible, but modern methods have made a great advance in the cost of working granite. The cost naturally depends upon detail; Norwegian granite work can be obtained nowadays for but a very small percentage over the cost of the best building stones, while as regards its strength, durability and appearance, it far surpasses any stone.

Great Resistance to Decay.

The atmosphere of towns leads to the decay of almost all building stones. Some of course decay more rapidly than others, and it is a matter for anxious consideration with architects who are erecting monumental buildings. Probably this is the primary cause for the favour which has been shown to granite of late for the construction of buildings in large cities. Not only is granite highly resistant to decay in town atmospheres, but it possesses in its small coefficient of expansion and contraction under heat and cold a physical property which has also an important influence upon the durability of the material. The co-efficient of expansion for granite is only one half what it is in stone, and though the alternations of heat and cold are somewhat slow and small elements, they are highly important in the disintegration or weathering of stones.

Ancient Granite Work.

Before dealing with the characteristics of granite and sources of supply we may briefly glance at the general history of the use of granite for architectural purposes. Firstly our attention is attracted by the earliest known use of granite, namely, in Ancient Egypt, where granite was quarried as far back as the reign of Zestus, King of Thebes, 1300 B.C. The famous red granite of Egypt was obtained near Assouan, or Ancient Syene, in Upper Egypt where it occupies large tracts between the First Cataract and the town of Assouan. The granite is very coarse, and the bright rose pink of the felspar crystals give it its predominating colour. A grey granite was also used by the Egyptians and is said to have come from near Syene and to have been found in close connection with the red.

The employment of granite for building purposes in Egypt, was, however, not so extensive as one is generally led to suppose. We may quote in this connection the following passage from "Art in Ancient Egypyt" by Perrot and Chipiez:—"People have seen a few granite obelisks in two or three of the European capitals, and they have too often jumped at the conclusion that the Egyptians built almost exclusively in granite. The fact is that there is but one building in Egypt the body of which is of granite; and that is the ancient temple of Gizeh, which is called the Temple of the Sphinx. Even there the roof and the lining of the walls were of alabaster. Granite was employed, as a rule, only where a very choice and expensive material was required. It was brought into play when certain parts of a building had to be endowed with more nobility and beauty then the rest. Thus, there are in the great temple of Karnak a few small rooms, called 'the granite chambers,' in which the material in question had been employed. Elsewhere in the same building it was only used incidentally. In the Pyramid of Cheops the lining of the two 'upper chambers' is of granite. In many of the Theban temples it was employed for the bases of columns, thresholds, jambs and lintels of doors. It was also used for isolated objects, such as tabernacles, monolithic statues, obelisks, and sarcophagi. The enormous quantity of granite which Egypt drew from first to last from the quarries of Syene was mostly for sculpture."

The Romans.

The Greeks used this granite after the Egyptians, and the Romans subsequently to the Greeks. The Romans did not, ap-

PORCH OF ST. MARY MAGDALENE'S CHURCH, LAUNCESTON.

parently, quarry this stone until the third century A.D., although it was known to them before then and had been used in Rome, for an inscription on the Antonine Column gives the date—the ninth year of Trajan, of A.D., 106, and another inscription on the obelisk in Piazza del Popolo, in Rome, records the date B.C. 23, and was brought over by the order of Augustus. The stone was well known in the time of Pliny. Corsi enumerates 12 obelisks and 714 columns of the red Syenite granite and 1,787 of the grey granite from Syene as having been in Rome.

The Egyptian granite does not weather particularly well in a damp climate. In Egypt the granite does not remain uninjured for ages unless it is raised above all contact with the ground. The following passage from "Stone" for July, 1903, bears on this point:—"The Egyptians evidently knew that whenever their granite was exposed to damp there was danger of decomposition, and they were in the habit of building obelisks or other granite monuments on foundation and substructures of limestone; these being found at the present day perfectly preserved, while the granite above them shows signs of decay in proportion to its contact with the earth subsequently accumulated around it."

Cleopatra's Needle on the Victoria Embankment, London, and the obelisks in New York and Paris are of this red Syene granite, and many examples are to be seen in the British Museum.

The Romans used another granite from Egypt which is known either as the "Granite of the Forum" from its having been extensively used in Trajan's Forum or as Lapis Psaronius from the word "starling," owing to its spotted appearance. This granite was not worked before the reign of Claudius, and Mons Claudianus was the name given to the long tract of land where the quarries were situated, this being some 55 miles from the red "porphyry" quarries at Djeebel-Dokhan, During the reign of Trajan, Fons Traianus (now Djeebel Fateereh) was founded in order to work these quarries more conveniently. New quarries were opened and worked under Septimius Severus about A.D. 207, between Syene and Philae in the Thebaid. The Alexandine Column is said to have come from these quarries. The colour of this granite is black and white and has a spotted appearance. The column in the Piazza del la Trinita, Florence, is of this granite, as also two columns in the portico of St. Peter's, and the column in Venice on which stands St. Mark and the Lion, brought from Tyre, by the Doge Michielli in 1127, and the red granite column of St. Theodore and the Crocodile standing next it. Remains of both these granites are still to be seen at Tyre.

The Romans in addition to using granits from Egypt, employed a white granite from the Island of Elba, the material constituting the upper part of the Monte Capanna near Marciana Marina. This granite is believed to belong to the Tertiary system. It is used for the columns of the portico of the Pantheon, which are 1.49m. in diameter and 11.65m. in length. The Pantheon was dedicated by Marcus Agrippa about 27 B.C., so that this is a very early example of the use of granite. The Roman quarry was at Seccheto, near the sea, at the foot of Monte Capanna, and Jervis, in 1859, saw there several ancient columns lying in the quarry roughly hewn out. The Pisans used a good deal of the Elban granite during the Republic, three of the eight large granite columns of the Baptistery of Pisa coming from that island in 1159. In 1564 four columns of this granite were used in the construction of the Porta Pia in Rome. The tribune of the Duomo of Ravenna was made of one piece of Elban granite or large dimensions, and the Grand Duke Cosimo had a huge basin made of the material, which is now in the garden of the Pitti Palace, while in the interior of Milan Cathedral on either side of the main porch are two huge monolithic columns of Elban granite. The Romans also obtained granite from the neighbouring island of Giglio.

Early Work in England.

The earliest use of granite in this country for building purposes was in the form of random rubble rocks obtained from boulders upon the surface of the ground, and early buildings built in this manner are to be found in Devon and Cornwall, in the North of Scotland and in Ireland. In the Gothic period the local facilities for obtaining granite in Cornwall led to its adoption for a number of churches there, two of which we illustrate, but otherwise only a small amount of granite was worked in the form of small columns and inset pieces of the material which were often polished. It is, however, only within about the last 100 years that granite has become generally appreciated and properly worked for architectural or engineering purposes.

Mr. Charles De Guchy, in an article on Cornish Churches, published in the Journal of the Royal Institute of British Architects, for September 30th, 1899, says: "Granite was the material chiefly used in building, and, of course, lends itself to nothing so much as to massive and simple treatment. . . . The granite used in the Land's End district is very coarse in grain, and has nearly everywhere weathered badly, the carvings and mouldings being nearly obliterated. This material may be easily had in large blocks, and as a result, even the smallest Cornish buildings attain a certain dignity owing to the size of the blocks of which they are built. Some of those I measured here and there in the walls of very small churches were as much as 6ft. long, 2ft. high, and 9ins. deep. They are as a rule used only as a facing, being bedded on their narrowest face and backed with rubble masonry inside. The largeness of the materials compared with the smallness of the churches is everywhere remarkable; the piers of the internal arcades, for instance, are very often monoliths, but on account of the small size of the churches, they seldom exceed 10ft. in height, and are much more often from 6ft. to 8ft. high. It is no uncommon thing to find an arch of 8ft. span constructed of four blocks while the smaller doorways are nearly always made of four blocks, one for each jamb and one for each side of the arch. In many cases, rubble masonry is freely used, both outside and inside the church, though in the latter case it was probably intended to be plastered; in such cases the only dressed stones are the window jambs and traceries, door jambs, piers and arches of arcades, coping stones, etc., etc.

"The towers are usually very plain and massive, built of large coursed blocks, and are nearly always slightly battered inwards to the top, or set back at string courses, which make the different stages; they are not as a rule very lofty, but there are exceptions, such as St. Buryas, Probus, and St. Austell, etc. In many cases they have no buttresses; when these do occur they are placed at a short distance from the angle of the tower, and not immediately on it. The buttress courses for the most part do not range with the courses of the tower walling, so that there is a straight joint on either side, and constructionally they can be of very little use indeed. This want of proper bonding is remarkable in all Cornish work, the smaller buttresses to the porches being worse, if anything, in this respect; the object seems to have been to use the blocks of granite with as little cutting as possible. The tower most often ends in a simple battlemented parapet and four angle pinnacles, but if it has a staircase turret, this is carried up slightly higher than the pinnacles, and finishes sometimes with a spirelet, and sometimes with battlements. There are very few spires in the county. The tower has belfry windows, with louvres at the top stage on all four sides; at the bottom the west door opens into the nave, and above it is the west window; between these two stages there is nothing but plain coursed masonry. It is this plain, unpierced wall surface that gives such an air of dignity and solidity to the smallest of Cornish towers."

St. Mary Magdalene's Church at Launceston, which we illustrate, was begun in 1511, was consecrated in 1524, though all its details were not finished until about 1540. This remarkable granite building in Perpendicular style was erected at the sole cost of Henry Trecarell, who had in consequence of the sudden death of his wife and infant son, determined to devote his wealth to the glory of God. The tower belonged to a former church erected in the 14th century, and it stands 26ft. away from Trecarell's church, the space between having been left by him, it is supposed, to serve as the site for a new tower. He died in 1544, before he could undertake it. The space is now filled by a vestry of comparatively recent date. The tower has thus survived over 500 years. The lines of the roof of the former church are still visible on its eastern face; it is surmounted by pinnacles and an embattled parapet of squared, unmoulded blocks of granite. The external surface was unfortunately "renovated" in 1879, being chipped over with the hammer, and the interstices of the granite blocks filled with cement. Opposite the present belfry entrance, on its western side, there is a high and beautiful arch which opened upon the nave of the former church, pulled down in 1511. The tower is 72ft. high and 20ft. square at the base, with a projecting stair case turret at its south-east corner, and flat buttresses on each face. The present church measures 112ft. 6ins long by 59ft. wide; its axis runs south-east and north-west. The walls are cased throughout in sculptured granite and are 3ft. thick. The south porch projects 11ft. and forms the principal entrance. On the shield beneath the canopied niche in the centre of this porch appear the Trecarell arms, and on the scrool: AN. DOM. MCCCCCXI. The nave of the church is divided from each aisle by seven elegant moulded monolith granite columns, 12ft. high. The west end was never completed, probably because the erection of the new tower was intended, as referred to above.

Another ancient and elaborate Cornish example of granite is the ornamented tower of Probus Church.

St. Cleer Church is situated about two miles from Liskeard in Cornwall. The tower is 97ft. high, and is constructed of large and well cut granite blocks. On the north side of the building there is a Norman doorway with zig-zag mouldings, now walled up. St. Cleer is near the Chees-

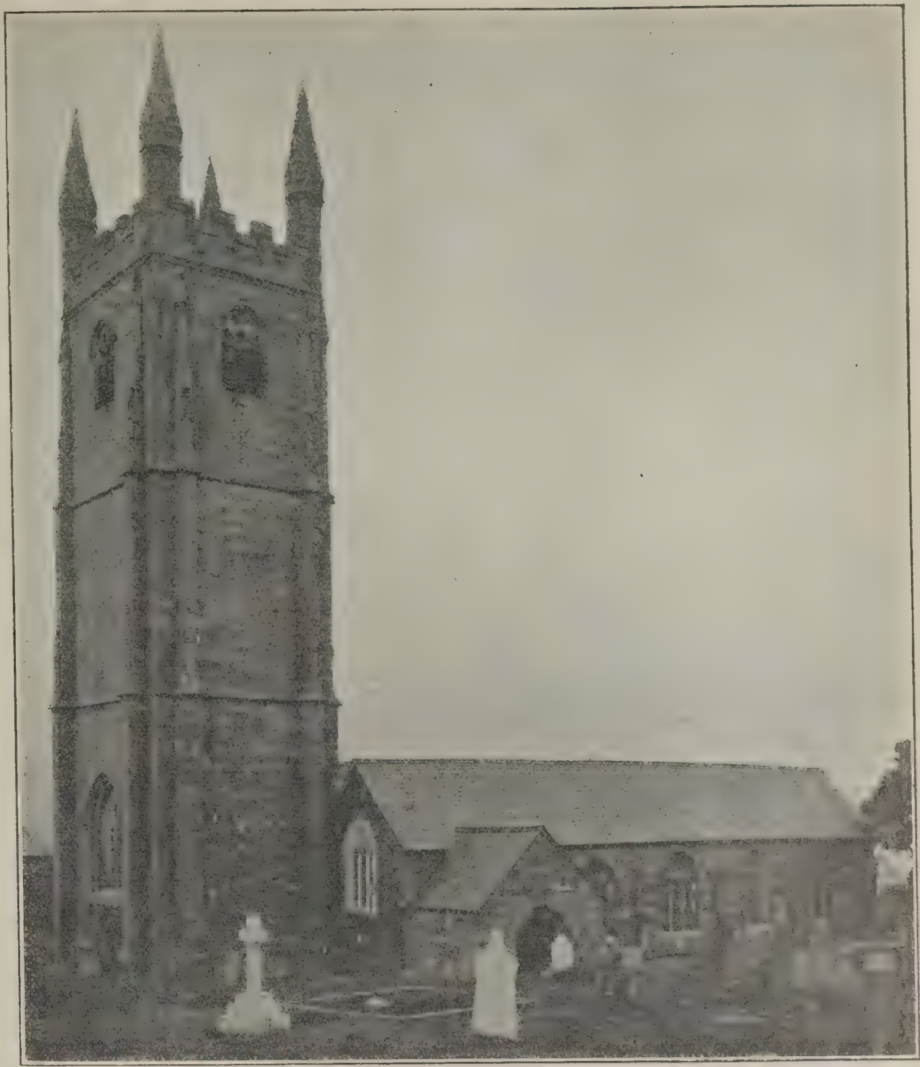
wring—that remarkable ancient monument which consists of tabular blocks of granite heaped one upon the other to a height of 24ft., the stones at the base being less than half the size of those at the top, which are 10ft. and 12ft. in diameter, so that these piles look like huge fungi. The Cheesewring granite quarries have worked large quantities of this fine deposit of this material which was used at St. Cleer. At the time the church was built, probably surface granite was mostly used. The tower pillars on the north side of the nave, and most of the windows are of dressed granite, and granite is largely mixed in the walls with a sort of general building or free-stone. The south arcade is of Polyphant stone, St. Cleer being near the Polyphant-Tamar quarries. The church was recently restored under the direction of Mr. G. H. Fellowes Prynne, F.R.I.B.A.

In modern times the first quarrying at Aberdeen of granite in the form of worked blocks seems to date from about 1764, when it was resolved to pave the streets of London with Aberdeen granite. From that time those quarries were increasingly worked. Machinery was first used in quarrying the Aberdeenshire granites in 1795, when stones of large dimensions were ordered by the Admiralty for the docks at Portsmouth, then in course of construction.

The Modern Use of Granite.

In referring to the modern use of granite, we concern ourselves chiefly with granite masonry. It is true that a good deal of work has been done for many years past in the construction of shop fronts, columns and small pieces of granite work set into a framing of stone or brick, but this is of comparatively small importance. It might almost be classed with the erection of granite monuments in cemeteries, in which probably a greater quantity of granite has been used than in architectural work. In all such cases the beauty of the material is far more important than its durability. To bring out the beauty of the material the work is often polished. Now a polished material is very difficult to handle successfully in external work. There is an aesthetic reason for this, for if a material with a crystalline structure, such as granite, upon which the hardness and strength of that material depends, has that structure obscured by polishing so as to give a glassy appearance which we instinctively associate with an amorphous condition, the effect is to cause the mind to be mistaken in its valuation of the true nature of that material. The whole logic of the articulation of the structure does not then become apparent, and its architectonic quality is destroyed. For this reason granite is usually left with a dull finish. It may be left rough and rugged when it is desired to give great appearance of strength such as in the lower storeys of a large building, or it may be finely dressed so as to be quite smooth, except that it is not polished, though it must be admitted that there are examples of comparatively successful use of polished granite plinths by eminent English architects. Polishing is quite legitimate in internal work and indeed is desirable on the score of cleanliness and full demonstration of the richness and beauty of the material. Granites challenge coloured marbles for such purposes.

(To be Continued.)



ST. CLEER CHURCH, NEAR LISKEARD. *Photo: Coath.*

INTERIOR OF ST. CLEER CHURCH, NEAR LISKEARD. *Photo: Coath.*

GLOUCESTERSHIRE ARCHITECTURAL ASSOCIATION.—At last week's meeting of this Association at Gloucester, Mr. H. Dare Bryan, F.R.I.B.A., of Bristol, read a paper on "Byzantine Influence on the Plan Form of the Western Cathedral." The lecturer commenced with the typical plans of the Roman basilica, and traced the development through the era of the early Christian Church in Italy to the magnificent edifices of the Byzantine period as exemplified in St. Sophia, Constantinople. Examples of the later Greek churches were shown, and the gradual evolution of the Western Cathedral, with its "long-drawn aisle" was traced in detail, Gloucester Cathedral, with its especially eastern type of plan, being the first of the English cathedrals to be illustrated, and Ely the last.

Law Cases.

CONTRACTORS AND RATING OF THE SITES THEY OCCUPY.—Is a master builder liable to be rated for the occupancy of the site on which he is erecting? This point, novel in rating law and of considerable importance to builders, awaits the decision of Mr. Shepherd Little, the Deputy Recorder of Liverpool, who on February 8th heard legal arguments in an appeal to Messrs. Morrison and Son, contractors for the erection of Liverpool's Cathedral, who object to the action of the Corporation in levying on them a rate in respect of their occupancy of certain portions of the land forming the site of the Cathedral. On this enclosed site Messrs. Morrison and Son have an office, stone-sawing plant, cranes and other building appliances, and the case for the Corporation is that the occupancy of the site with these things renders the contractors liable to assessment. The chief argument for the appellants was that they are not the permanent occupiers of the land, and that they are only there for the purposes of their work, but the Corporation's reply to this was that Messrs. Morrison will be there for at least ten years, and ought to be regarded as the rateable occupants of the land, especially as they are making a profit out of their work. The case, which is being defended by the Master Builders' Association, is regarded as a test one. The Deputy Recorder announced that he would give his decision on the opening day of the Assizes.

WHAT IS A SITE?—In the King's Bench Division of the High Court of Justice, on February 7th, Mr. Justice Eve gave his decision on a point raised in connection with the gift by the late Mr. John Feeney (proprietor of "The Birmingham Post") of £50,000 to the Birmingham Corporation for a new art gallery. The Corporation are extending their Council House, and proposed to assign the first floor of 16,000 sq. ft., connected with the existing art gallery by means of a bridge, as a site for Mr. Feeney's gallery. The trustees of the will of the testator contended that the words "on a site provided by the Corporation" meant that the Corporation should provide a plot of ground for a separate and self-contained gallery and not merely a floor above municipal offices and shops. His lordship said he had consulted various dictionaries and had come to the conclusion that he ought not to attach to the word "site" the strict meaning for which Mr. Feeney's executors and trustees contended in the carrying out of the scheme. He gave judgment therefore in favour of the Corporation.

THE CLERK OF WORKS: CONDITIONS OF HIS EMPLOYMENT.—An interesting case arising out of the recent extensive alterations at the Grand Theatre, Birmingham, came before his Honour Judge Bray in the Birmingham County Court on February 6th. The claim was by a clerk of works named Smyth, of West Dulwich, against Messrs. Frank Matcham and Co., architects, of London, for the sum of £39 16s., damages for wrongful dismissal, breach of terms, and moneys disbursed while plaintiff was employed as clerk of the works on certain alterations to the Grand Theatre. Counsel for plaintiff said that in February, 1904, Mr. Smyth was engaged by the defendants as a draughtsman in London at £2 a week. He remained in this position until 1907, and then on June 3rd was sent to Birmingham as clerk of the works to superintend certain alterations at the Empire Music Hall. Then on August 7th plaintiff had instructions to help Mr. Foster at the Grand. On August 12th he received the plans of the work, and took over the office, performing the duties satisfactorily till September 23rd, when, before the work was finished, he was summarily dismissed by telegram. He then received a letter which said that the defendants were quite satisfied with his work, but they felt that it was a very difficult job and required an experienced man. Later, Mr. Briggs, one of the partners of the firm, explained to him that the man appointed in his place was an older servant of theirs, and he must give way. The claim was for £3 10s., a week's wages for as long as the work lasted, amounting to £38 10s., and for £1 6s., sums paid out by the plaintiff. Under cross-examination the plaintiff admitted that he received notice of dismissal in April last, but denied that Mr. Briggs had said he would try to find him work with Moss Empires, Ltd., in Birmingham. Mr. Briggs had simply said he would arrange with him about his salary. While in Birmingham his salary had been paid him by Moss Empires, Ltd. Mr. Hackett, architect, said a clerk of the works was almost invariably employed by the architect, paid by him, and dismissed by him. He had never known it otherwise. The appointment of a clerk of the works was until the piece of work was finished, and he was entitled to be paid for the whole of that time. Mr. E. Sale, another architect, gave similar evidence as to custom. Mr. Briggs, a member of the firm of Matcham and Co., said he had never before heard that the clerk of works was the servant of the architect. In this particular case they had the authority of Moss Empires, Ltd., to dismiss Smyth. He had never heard of the custom that the clerk of works was appointed for the whole work, and he had told Smyth that it was only a temporary job. Other evidence was called by the defence to show that clerks of works were servants of the building owners and not of the architect, and that they could be dismissed while the work was in progress. Counsel for the defence submitted that the plaintiff had sued the wrong people. If the plaintiff had any case at all it was against the building owners. After retiring for half an hour the jury found for the defendants, considering that plaintiff was in the employ of Moss's Empires, Ltd. They also wished to express their sympathy with the plaintiff.

EMPLOYERS' LIABILITY ACT: THE DIFFICULTY OF RECOVERING UNDER IT. — At the Clerkenwell County Court on Wednesday last, an action was brought under the Employers' Liability Act by a labourer named Mayo against a builder named Revill, of Hampton Hill, £100 damages being claimed for personal injuries. The plaintiff said he was working upon a warehouse in Clerkenwell. The building was being raised bodily by means of hydraulic jacks, one of which fell over, and his left foot was badly injured. He had not been able to work since. The defence was that the jack did not fall upon plaintiff. A strut fell on to the timbers and rebounded on to the plaintiff's foot. The plaintiff had previously been warned not to lean against the strut. The jury found there was no negligence on the defendant's part, or defective machinery, and awarded a verdict in his favour. Judge Willis: "I quite concur in the verdict. This is a most difficult Act to recover under. I have never known a successful claim under it since I have been a county court judge. There is an Act which provides a remedy for all ills, and that is the Workmen's Compensation Act." The application under this Act was adjourned.

Our Plate.

Mr. Henry T. Hare's Design for the London County Hall.

We illustrate in this issue the design for the London County Hall submitted by Mr. Henry T. Hare, F.R.I.B.A., who was one of the eight architects specially invited to compete. We have already dealt with the design in the criticisms of the competition that appeared in our issues for February 5th and 12th, and we would only here repeat that this scheme is a very fine one and would seem to have been among the few in the running.

In the second notice of the competition, that appeared in our issue for last week, two obvious errors occurred. The matter was set up on the "Linotype," and on page 129, in the description of Mr. Atkinson's design, the line "180ft. by 65ft. is placed next the principal," has been inserted above instead of below another line; while on page 131, in the last paragraph of the criticism, a line with the words "end be worthy of the oppor-" has been inadvertently left out altogether by the compositor: the sentence should read—"However, one hopes that, whatever is done, may in the end be worthy of the opportunity afforded by this great building." The "Linotype" has many advantages, more particularly those of quick setting and easy handling, but it has also the disadvantage that a fresh line, with a correction in it, may easily be put in the wrong place, or omitted altogether, and the errors in question arose from this cause.

An Adverse Criticism of Mr. Knott's Selected Design.

An "Architect" contributor to the "Daily News" (whether one of the unsuccessful competitors or not we are unaware) makes the following adverse criticism on Mr. Ralph Knott's selected design for the London County Hall:—

". . . The real difficulty lay in discovering a simple plan upon which the required accommodation could be provided without carrying the building to an enormous height. The site is by no means too spacious, and is not perfectly rectangular.

"Now, on all hands is heard the remark that Mr. Knott's plan is simple. 'He has won on the plan,' say people who are supposed to know; 'the elevation is nothing.' But the assessors themselves, in recommending the design, state that the two wings, which are advanced 50ft. towards the river from the main frontage line, and in which (with the terrace they enclose) Mr. Knott secures 25,000ft. of space, constitute an impossible feature. Obviously that is so; the idea of breaking up the river front in such a manner could never be allowed in execution. And we should have thought that this fault alone would have justified the rejection of Mr. Knott's scheme *in toto*; because the 25,000ft. of space must now be found inside the main lines of the plan, and, as we shall show, there is already not an inch of room to spare.

"Take the suite centred in the council chamber, and it will at once be seen that

it is lacking in spaciousness and orderly arrangement. The cloakrooms and lavatory accommodation are ridiculously cramped; the ante-chamber in which members would mix among their supporters and friends is but 50ft. long, and narrow in proportion; the circulating corridors are but 9ft. wide; the chairman and vice-chairman are located as far from their duties as possible, and in passing from their private rooms to the chamber must traverse the public corridors. The plan of the whole would be anything but simple in working. And still there is an additional space of 25,000ft. to be found somewhere!

"The 'grand' entrance to the building projected by Mr. Knott is in the Belvedere Road, and immediately inside it are grouped the sample room and other rooms to which there would be a constant stream of tradesfolk, armed with packages and bundles. Entering with such a crowd the councillors would be reminded of the business side of their deliberations, and a properly democratic spirit would be fostered.

"In front of this main entrance Mr. Knott has placed the hall accommodating 800 people. This apartment is quite unconnected with the main building, and therefore practically valueless, as it could not be used en suite with the council chamber, library, etc., on ceremonial occasions.

"Gentlemen of the Press will be interested to learn that, whereas the sample men may enter by the 'grand' entrance, they must themselves arrive by way of the basement, there being no access to their particular staircase from the ground floor. And, though it is generally recognised that one of the most important considerations in the construction of a large building is the angle at which light will reach the lower windows, in Mr. Knott's plan we see over half a mile of corridors which the light of day will never penetrate at all.

"Coming now to the elevations, there is little to be said except in disapproval. In style they are a pale reflection of the work of Mr. Norman Shaw, one of the assessors. The river front embodies a central feature which the official report declares to be impossible, and is generally with turret, chimney stacks, and terminal blocks, devoid of all suggestion of the grandeur which should be inseparable from so vast a structure.

"The elevation to Belvedere Road is somewhat better; but neither this nor the one facing Westminster Bridge calls for comment when the opportunity afforded by the river front has been productive of so little that is in accord with the most ordinary conception of the London County Hall."

The Establishment Committee's Perspective.

The Establishment Committee of the London County Council have had under consideration the question of providing a model or drawing of the selected design for the County Hall, as modified by the assessors. The cost of a perspective drawing in water-colour would be about £30, and the length of the building as seen in this drawing would be 3ft., whereas a precise model of the building is estimated to cost several hundred pounds. The Establishment Committee are of opinion that a perspective drawing would be very useful, and they have therefore given instructions for one to be prepared. The question of a model has been postponed until a later date, when the details of the design and plan of the new offices to be erected are before the Council.

Correspondence.

Bournemouth Municipal Buildings.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—We thank you for the fairness shown in the leading article published in your last issue, and for the spirit of sympathy with us upon many points. We feel, however, that our matter calls for further comment.

The £135,000 scheme, as published, has been definitely abandoned by the Town Council, because of its cost, which is far in excess of their instructions, and also of what is considered necessary. However good the conception of the scheme may or may not be, does not affect the question in the least degree, as in other and essential conditions it greatly exceeds what is felt to be the real requirements of the town.

The Corporation, realising this, consider that £80,000 should be ample to provide for a stately and dignified building, sufficiently large to satisfy their requirements for many years to come.

In order to obtain perfect freedom of action for the future, the Town Council came to an amicable arrangement some months ago and paid the architects' fees in settlement, as stated in our previous letter.

The town is now free to adopt whatever course it wishes, and we are entirely at a loss to understand how a public competition could be regarded as an injustice.

It is true that the scheme to cost £135,000 has been illustrated, but this cannot be of help to the competitors, as a design so costly could bear no resemblance to the one that is now contemplated at practically half the amount.

Turning to the broader question of competitions in general, we agree with you that even with a qualified professional assessor, and conditions drawn up by a representative body of the profession, the system is not perfect, but we think that architects generally will be of the opinion that it is the best devised up to the present that can be urged upon most public authorities with a reasonable prospect of success.

Yours truly,
J. H. BREWERTON, F.R.I.B.A.,
T. W. REYNOLDS,
SYDNEY TUGWELL.
Bournemouth.

The Building Trades Exhibition, Olympia, 1909.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—In view of the length of the letter from Messrs. Smith and Bridges appearing in your issue of February 12th, I regret to have to further trespass, although for the last time in this connection, upon your valuable space. I think, however, you will agree with me that certain of the points raised demand a reply, in justice alike to myself and to the building trades.

Your correspondents deny that their forthcoming exhibition is "on similar lines to mine, yet they confessedly make "Building" part of their title, on the ground that "it is so closely and intimately connected with municipal work," and they also use the words "Municipal and Public Health," which, as is well-known, are sections covered by my exhibition. Theirs are distinctions without a difference.

In any event, whether their Municipal Exhibition is a Building Trades' Exhibition in whole or in part, or not at all, the fact remains that exhibitors of mine, in the general as well as in the municipal and public health sections, have been actually canvassed. I am therefore bound to make it quite clear that my exhibition at Olympia next year must not be confused with the projected exhibition at the Agricultural Hall. That such confusion occurs is evident from letters I am constantly receiving, the latest, under date of February 6th, stating:—"This firm, I suppose, wrote me a few days ago, and I, perhaps without sufficient consideration, took it to be your exhibition."

Yours truly,
H. GREVILLE MONTGOMERY.
43, Essex Street, Strand, W.C.

Income Tax Overcharges.

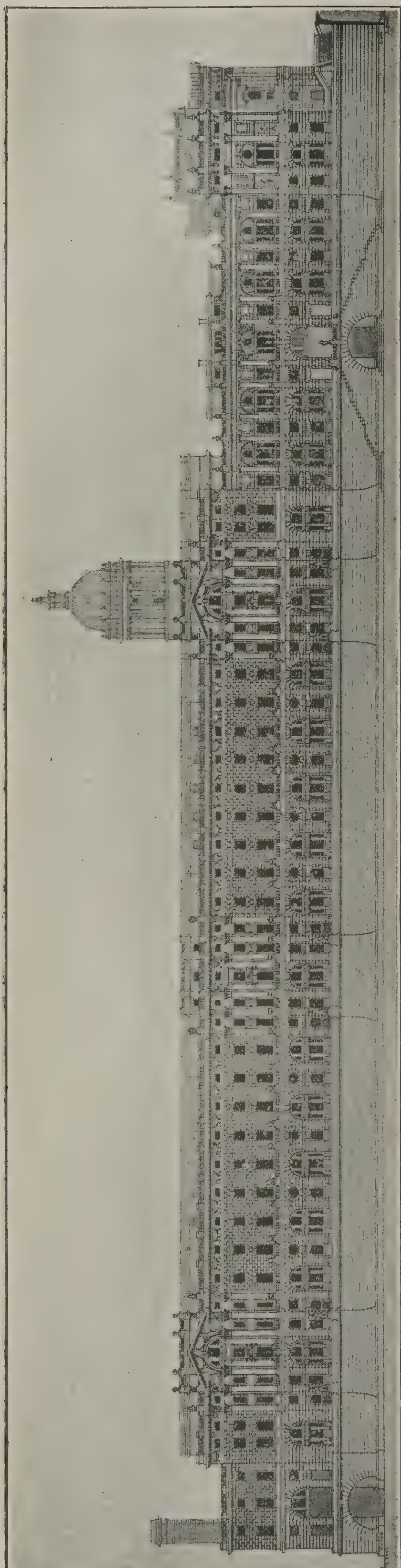
To the Editor of THE BUILDERS' JOURNAL.

SIR,—The Income Tax Acts provide that no repayment can be made, save in certain quite exceptional cases, unless the claim is made within the time limited by the Acts. In many cases claims can now be made for four years, and April 5th next is the last possible day on which a claim for the year ended April 5th, 1905, can be lodged. Claims for repayment can be made on various grounds in respect of income from all sources, even when said to be paid "free of Income Tax," and we shall be happy to advise any of your readers, without charge, whether or not they can make a claim for repayment, on receiving full particulars of their incomes, and a stamped envelope for reply.

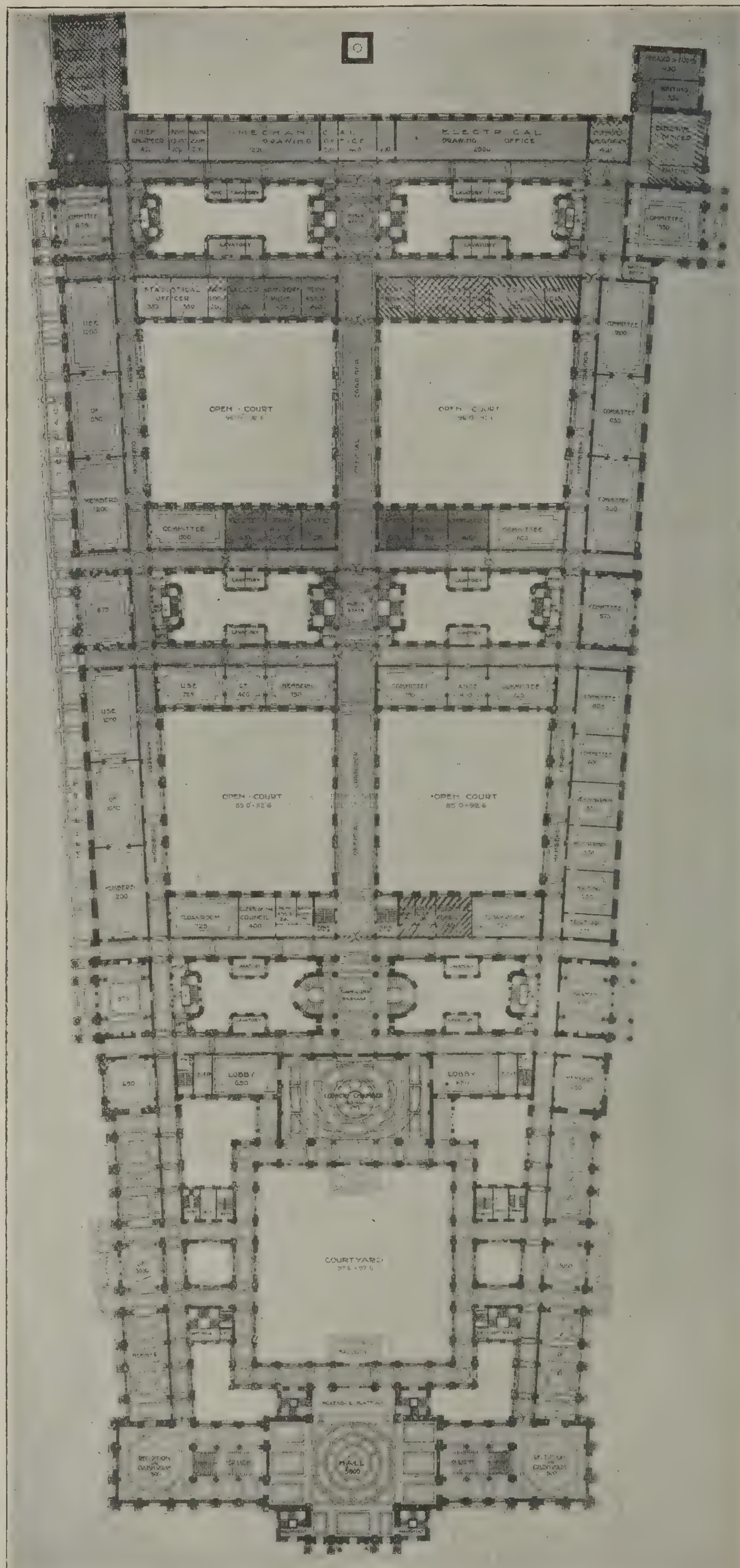
Yours truly,
THE INCOME TAX ADJUSTMENT AGENCY, LIMITED,
E. MONTAGUE,
Secretary.
9-11, Poultry, London, E.C.

"THE GLORY THAT WAS GREECE."—A paper with this title was read before last Wednesday's meeting of the Northern Architectural Association by Mr. Joseph Oswald, F.R.I.B.A. It described the ancient buildings and sculptures of Olympia, Delphi, Corinth, and Athens, and was illustrated by a large number of lantern views.

ACOUSTICS.—A joint meeting of the Architectural Section of the Royal Philosophical Society of Glasgow and the Associates' Section of the Glasgow Institute of Architects was held last week to discuss the question of "Acoustics in Relation to Buildings." Mr. Cullen presided. Mr. Blyth read a paper on the scientific aspect of the subject, illustrating his remarks by experiments. Mr. David Barclay discussed the subject from the practical point of view of the architect. He said he had always found it satisfactory to consider the deflection of sound currents as analogous to the cushioning of a ball on a billiard table. In the case of a church a short transept was dangerous if the best acoustics were to be obtained, because it produced echoes by deflecting the sounds earlier than those which reached the far end of the building. A concave end behind a platform was the worst form of construction from the point of view of acoustics, because the sounds were deflected into a central point instead of being deflected and radiating outwards in parallel lines throughout the building.



Elevation to River.



Plan of Principal Floor.

LONDON COUNTY HALL. DESIGN BY JEMMETT AND McCOMBIE.

IN PARLIAMENT.

(From our Press Gallery Representative).

Lighting of the Mall.

Mr. Harcourt has informed Mr. Lonsdale, in reply to a question as to the erection of the new electric light standards in the Mall, that the casting is now going on, and it is hoped that those required to light the space around the Queen Victoria Memorial will be completed and fixed before July. The standards for the Mall will follow in due course, but no date can be stated at present. Bronze founding is a lengthy process, and occupies much longer time than iron founding.

The Marble Arch Widening.

Mr. Lonsdale asked a question as to the outlay on the works being executed at the Marble Arch.

Mr. Harcourt stated that his department was incurring some outlay for the remaking of the roads within the Park. All other works being undertaken at the Marble Arch were to be paid for by the London County Council.

Insurance of Workmen on Government Contracts.

Mr. Fenwick asked the First Commissioner of Works whether he was aware that in some cases contractors had omitted to insure their workmen, under the impression that when men were engaged upon work for the Government there was no need for such insurance?

Mr. Harcourt said it had been reported to him that some such impression existed, but he hardly needed to say that it was wholly unfounded. Under the Workmen's Compensation Act the liability of employers whose workmen were engaged on work for the Government was precisely the same as that of any other employer.

Durability of Reinforced Concrete.

Mr. Horniman asked the First Commissioner of Works what was the estimated life of buildings in reinforced or ferro-concrete, such as are now being erected for the post office in King Edward VII. Street, E.C.; whether he had had any report of how this kind of construction resisted fire; and had he seen any reports or publications respecting the building so constructed after undergoing the test of fire at San Francisco.

Mr. Harcourt's reply was in these terms: "Buildings of ferro-concrete are believed by experts to be at least as durable as those of brick or stone. I have received a very valuable report confirming this opinion on this subject from the Joint Committee of the Royal Institute of British Architects, which is available for the hon. member at the cost of 1s. The experience of San Francisco, though interesting, is not of conclusive value, as the buildings there were subjected to earthquake fracture before the occurrence of fire."

Restoration Work at Whitehall Palace.

In answer to Mr. Claude Hay, the First Commissioner stated that the total cost of the works of restoration recently carried out in Whitehall Palace was £3,200.

Notes and News.

A New Hippodrome is to be erected on a site near the railway station at Aldershot.

* * *

The Atmospheric Steam Heating Co.'s System has been adopted for the new Glasgow art schools.

* * *

A New Bank at Wrexham has been erected from designs by Messrs. Grayson and Ould, architects, of Liverpool. The front is executed in "Skjberg" granite, supplied by Messrs. A. and F. Manuelle.

* * *

New Pavilion for Torquay.—Instructions have been given to the borough surveyor of Torquay to prepare plans for a pavilion to cost £10,000, in preference to those the carrying out of which would cost £14,000.

* * *

Liverpool Architectural Society. — The paper on "Holland" which Mr. E. Willoughby Faulkner was to have delivered before this Society on Monday evening last has been postponed until further notice, owing to the serious illness of the lecturer.

* * *

A Bridge by Inigo Jones —Llanrwst Bridge, between Carnarvonshire and Denbigshire, is proposed to be strengthened to meet the loads now put upon it. The bridge is said to have been designed by Inigo Jones in 1634. It consists of three arches, the central span being 62 ft. (a long span for the time when it was built) and two side spans of 45 ft. each.

* * *

Budapest in London.—Mr. Joseph Fischer, the official architect of the Hungarian capital, is now in London, engaged in laying-out a large official exhibit by the municipality of Budapest for the Hungarian Exhibition at Earl's Court next May. The exhibit will include models of the principal buildings and models of historic monuments and memorials of Budapest.

* * *

"Technical Literature," which has its offices in New York, and is published in England by Messrs. Archibald Constable and Co., Ltd., of 10, Orange Street, Leicester Square, W.C., will henceforth bear the more explanatory title, "The Engineering Digest." The magazine, which is published monthly at 1s., has been steadily growing in value and circulation, and is now a most valuable reference work to everybody interested in engineering enterprise.

* * *

Queensland Timber.—Information has just reached the City office of the Agent-General for Queensland, 73, Basinghall Street, E.C., that the following merchants in the Colony are prepared to undertake the export of the pine and hardwood timbers for which Queensland is so celebrated: — Associated Timber Merchants' Ltd., Brisbane; Brown and Broad, Ltd., Brisbane; James Campbell and Sons, Ltd. Brisbane; Queensland National Products Co., Brisbane; Rooney and Co., Townsville.

* * *

The Piccadilly Hotel.—The whole of the sanitary fittings in this hotel (shortly to be opened) have been supplied by Messrs. Doulton and Co., Ltd., of Lambeth, London, S.E. The closets are of their syphonic pattern, the baths are of white vitreous porcelain-enamelled iron, and the lavatories are of marble. Messrs. Doulton have also received the order for the complete lavatory installation at the Esplanade Hotel and Restaurant, Hamburg, to be opened this spring. This hotel is under the management of the Carlton Hotel, London.

* * *

Portland Cement Manufacture and Application.—A lecture on "The Manufacture and Use of Portland Cement, and its Modern Application to Building and Engineering Work" was delivered on Thursday last by Mr. G. M. R. Layton, managing director of the Associated Portland Cement Manufacturers (1900), Ltd., before the Building Students' Association of the Northern Polytechnic Institute. The lecture was illustrated by lantern and cinematograph views of the processes of manufacture and by demonstrations of the standard methods of testing cement.

* * *

The Demolition of Crosby Hall has now been completed. The Chartered Bank of India, Australia and China is spending about £1,000 in the marking, removal, and storage of the historical portions of the building with a view to the possible re-erection of the structure on another site, the estimated expense of which is believed to be about £3,000. Applications have been received from two or three private persons for permission to undertake the re-construction of the old hall. It is desired, however, that the historic remains should be, if possible, acquired by some public body for re-construction in London.

* * *

The "Grand Manner" in Architecture —Prof. C. H. Reilly delivered a lecture on "The 'Grand Manner' of Architecture" before last Thursday's meeting of the Manchester Society of Architects. The true essentials to "grand manner," he said, were unity, scale, and refinement. Some or all of these qualities were embodied in the buildings of the Egyptians, Romans, and Greeks. Mr. Reilly spoke in terms of high praise of the plan for the new County Hall in London which was awarded the first place in the recent competition. He thought it would be unfair were it not to be accepted on the ground that the hall, based on another design, could be erected for a hundred thousand pounds less money.

* * *

Queen Victoria Memorial: Protest Against the Marble Used.—Considerable dissatisfaction has prevailed for some time past among marble workers owing to the fact that the marble used for the Queen Victoria Memorial now being erected in front of Buckingham Palace was being worked in Italy and by foreign hand labour. A petition to the King has been circulated during the past month protesting against such labour being used, and on Thursday last Mr. Claude Hay, M.P., Mr. James O'Grady, M.P., and Sir William Bull, M.P., waited on the Home Secretary with this petition. (The petition is promoted by the Amalgamated Operative Marble and Slate Masons' Trade Society, supported by numerous other Unions). Mr. O'Grady pointed out that the difference in the price of wages paid to Italian workmen could not be taken as a valid reason for taking this work from British hands: the difference did not amount to much more than 10 per cent. The Home Secretary undertook to lay the petition before his Majesty in the ordinary course: when an official reply would be forwarded.

THE PROPOSED DIPLOMA IN ARCHITECTURE AT CAMBRIDGE.

In the "Times" of Thursday last was published a second letter from Mr. Reginald Blomfield, Mr. T. G. Jackson and Mr. Basil Champneys, in reference to the proposed diploma in architecture at Cambridge. The following are extracts:—

" . . . The proposal seems to imply that mere residence at the University gives a hall-mark to a student without regard to his studies during his University course; and we hardly think such a view will commend itself to those who know the possibilities of University education and who have the interests of our historic Universities at heart.

"Professor Waldstein has devoted himself to the correction of our erroneous arguments, but we have yet to confess ourselves unconvinced. He taunts the Board of Architectural Education, appointed by the Institute of British Architects, with not having provided for a liberal education. The Board, on the contrary, attached high importance to it, but did not feel itself competent to deal with matters outside the scheme of special training in architecture which it was appointed to consider. At the time that scheme was prepared, it was hoped that liberal education was still safe in the hands of the public schools and old Universities; but that confidence has been rudely shaken by recent developments at Cambridge, and it now appears that even that great University has to bow to the clamour for the curtailment of education in order to make way for technical training at the earliest opportunity.

"Professor Waldstein dismisses Sir Charles Villiers Stanford's analogies as more amusing than enlightening; but Sir Charles' analogy is a real one. Imagination and the faculty of invention are as essential in architecture as they are in music, and it is a somewhat remarkable omission that a Slade Professor should have overlooked this fact. The Professor's own analogy seems to us to be entirely fallacious. . . .

"The point at issue is whether it is desirable to substitute technical training for a liberal education at Cambridge, if not immediately, yet in the future. Does Professor Waldstein contend that the Cambridge Historical Tripos is a purely technical school on all fours with this proposed school in architecture? We should hardly have thought so badly of Cambridge educational methods. We would suggest to the Professor that education differs from technical training, not only in the subjects of study, but in its object and the point of view from which it is undertaken. The aim of education is to develop and strengthen the mental faculties of the student, whereas the aim of technical training is to acquire special knowledge for a practical purpose—in the case at issue the practice of architecture. To make his analogy stand, either the proposed school in architecture must be regarded as a liberal education, or if, as some at any rate of the syndicate hold, it is to be a technical school, the historical tripos must be regarded as a technical school. . . .

"Mr. Fletcher charges us with having misconceived the purport of the syndicate's report and with having raised up the bogey of a diploma in order to knock it down again. We regret that the heading of our letter, "The Proposed Diploma," etc., should have suggested any misunderstanding of the report. We would point out, however, that in our letter we did not in fact discuss the question of a diploma, but addressed ourselves to the substantial issue whether or not liberal education at Cambridge is to make way for special training. That the diploma is not quite such a bogey as Mr. Fletcher suggests is proved by the fact that the Vice-Chancellor and the Disney Professor signed the report of the syndicate, subject to the reservation 'that the scheme for a special examination does not come into operation until regulations for a diploma are adopted by the Senate.'

"Such a diploma would, in our opinion, be based on a misconception of architecture, and would be both misleading to the public and degrading to the art of architecture.

"In our letter to you of January 27th, 1908, we submitted that the proposed school of architecture at Cambridge is open to serious objection because it furthers the growing tendency to sacrifice general education to technical training, because it misconceives the functions of architecture, and because, instead of giving architects what they want and cannot supply, it offers them something that they, by the nature of the case, can supply very much better themselves, and in fact already possess. Our objections have not been met by the arguments of your correspondents, neither has the exact position of the Cambridge syndicate been rendered any clearer. . . ."

Obituary.

Last week the death of Sir James Knowles, M.C.V.O., the founder and editor of the "Nineteenth Century," now "Nineteenth Century and After," took place at his Brighton residence. Sir James, born in 1831, was the son of an architect, and educated at University College, after which he entered his father's office, obtaining a considerable amount of success. Some of his work included the Thatched House Club Building, Kensington House (now pulled down), the gardens in Leicester Square, and "Aldworth," the residence of Tennyson. He was the founder of the Metaphysical Society and from 1870 to 1877 he was editor of the "Contemporary Review," in which year he founded the "Nineteenth Century," which he conducted until quite recently with great success.

New Companies.

T. Kennedy, joiner and builder, Middlesbrough. First meeting, O.R.'s, Middlesbrough, February 20, at 11. P.E., Middlesbrough C.C., February 21, at 10.30.

H. Holborne, builder, Llantrisant. First meeting, O.R.'s, Pontypridd, February 20, at 10.30. P.E., Pontypridd C.C., March 17, at 10.15. R.O., February 5.

H. J. Pitts, builder, King's Heath and Birmingham. First meeting, 191, Corporation Street, Birmingham, February 21, at 11.30. P.E., same, March 18, at 2.30. R.O., February 4.

J. A. Davies and Son, builders and contractors, Swansea. First meeting O.R.'s, Swansea, February 21, at 12. P.E., Town Hall, Swansea, February 28, at 11.30. R.O., February 4.

John Knowles and Co. (Wooden Box), to acquire the business of manufacturers of fireclay goods, sanitary stoneware pipes and connections, terra-cotta, chimney-pots, carried on at Mount Pleasant Works, Wooden Box, in the counties of Leicester and Derby, and elsewhere, as John Knowles and Co. Capital: £65,170.

New Aberystwyth Brick Co., Ltd., to acquire the business carried on at Aberystwyth as the Aberystwyth Brick Co.; to adopt an agreement with J. Osmen and Co., Ltd., and H. Slee; and to carry on the business of manufacturers of bricks, tiles, pipes, pottery, terra-cotta, etc.; Granville House, 3, Arundel Street, Strand, W.C. Capital: £3,000.

Spring Bank Brick Co., to acquire from L. de B. Taylor the land and property (including mining rights) known as the Spring Bank Brick Works, at Springbank, Willenhall, Staffs., containing about six acres, and to carry on the business of brick and tile works, etc. Capital: £2,500.

Bankruptcies.

During the week ending February 15th, twenty-three failures in the building and timber trades of England and Wales were gazetted.

J. E. Hughes, builder, Ashford. R.O., February 6.

W. F. Cave, builder, London. P.E., Bankruptcy Court, March 18, at 11. R.O., February 3.

W. Wright, builder, Nuneaton. P.E., County Hall, Coventry, March 2, at 2.30.

W. Owens, builder, Penygraig. P.E., Pontypridd C.C., March 17, at 10.15.

H. A. Annett and Son, builders and contractors, Andover. R.O., February 4.

S. Chambers, builder and contractor, Swindon. Gross liabilities, £1,622; assets, £134.

Betteridge and Featherstone, builders and contractors, Poole. P.E., Town Hall, Poole, March 6, at 11.30.

H. G. Dodwell, timber merchant, Cheltenham. First meeting, Cheltenham C.C., February 20, at 3.15. P.E., same, February 27, at 12.

A. Tarling, builder, Charlton Kings. First meeting, Cheltenham C.C., February 20, at 4.30. P.E., same, February 27, at 12. R.O., February 4.

F. Cockrell, builder, Gorleston. Gross liabilities, £3,890; £530 expected to rank for dividend; deficiency, £92.

J. D. Knill, builder, Ilfracombe. First meeting, 94, High Street, Barnstaple, February 26, at 3.15. P.E., Bridge Hall, Barnstaple, same, at 3.45. R.O., February 3.

Coming Events.

Wednesday, February 19.

London Master Builders' Association.—Annual Dinner, Carpenters' Hall, at 6.30 p.m.

Architectural Association (Camera and Cycling Club).—Prof. Beresford Pite, F.R.I.B.A., on "Domed Churches," at 7.30 p.m.

Edinburgh Architectural Association.—Mr. J. Campbell Mitchell, A.R.S.A., on "Colour," at 8 p.m.

Thursday, February 20.

Leeds and Yorkshire Architectural Society.—Paper by Sir Charles Nicholson.

Friday, February 21.

Architectural Association.—Mr. Edward Warren on "Oxford," at 7.30 p.m.

Institution of Mechanical Engineers.. — Prof. John Goodman on "Tests of a Live Steam Feedwater Heater," at 8 p.m. Annual Report of Council.

Saturday, February 22.

Architectural Association.—Fourth Spring Visit, to Messrs. Mappin and Webb's new premises in Oxford Street, at 2 p.m.

Monday, February 24.

Surveyors' Institution.—Mr. W. G. S. Rolleston on "The Small Holdings and Allotments Act," 1907," at 8 p.m.

Wednesday, February 26.

Manchester Society of Architects (Club Night). —Mr. Halliday on "Ruskin," at 6.30 p.m.

Architectural Association.—Mr. Thomas H. Mawson, on "Garden Architecture," at 7.30 p.m.

Surveyors' Institution.—Annual Dinner, Hotel Metropole, at 7 p.m.

Northern Architectural Association (Students' Meeting).—Mr. H. L. Hicks on "Some Norfolk Churches," at 7.30 p.m.

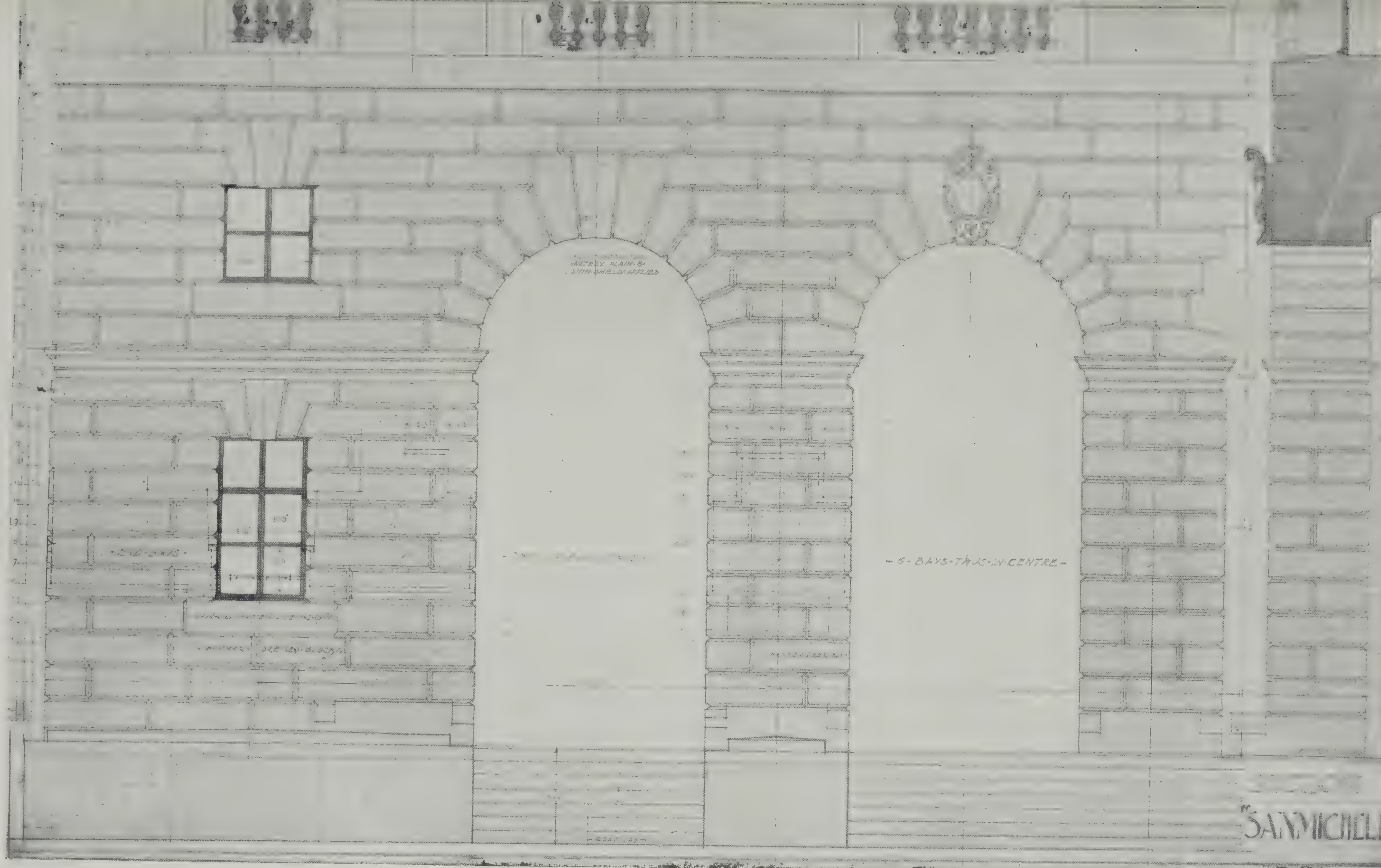
Insurance.

Subscribers to "The Builders' Journal" are entitled to a Free Insurance for £500. Every subscriber should apply for this, sending a postcard with the name of the newsagent with whom the order has been placed. Subscribers can also obtain a General Accident and Sickness Insurance (the "Lighthouse" policy) at a reduced premium, which includes the Annual Subscription to this Journal. A pamphlet giving full particulars can be obtained free on application.

Free £500 Accident Insurance Coupons have this week been sent to the following:

T. C. C. (Forest Hill), L. G. (Watford), J. L. (Edinburgh), B. G. (Kingston), L. L. (Cardigan), J. B. T. (Darwen), H. A. C. (Westminster), D. L. H. (Borth), G. V. C. (Birmingham), W. C. W. (West Dulwich), J. R. L. (Burnley), H. T. don, W.), J. P. G. (Hilworth), E. H. Liverpool), J. W. P. (Cambridge), W. G (Liverpool), T. P. (Croydon), V. W. (Bournemouth), C. P. (Frinton), A. C. B. (Maidenhead), J. C. H. (Northampton), W. H. (Crofton Park), W. M. (Coalville), S. C. G. (Preston), J. S. (Nantwich), H. P. (Newcastle), S. J. A. (Bridgwater), J. L. (Wandsworth), A. W. A. (Hawkhurst), J. A. (Greenock), A. D. H. (Cardiff), R. A. D. (Esher), H. C. (Newark), E. T. A. (Rotherham), H. G. (Thornton Heath), M. M. K. (Plumstead), A. V. P. (Halifax), F. A. (Woking), G. H. S. (Birmingham), T. T. (Longton), J. A. S. (Cambridge), F. E. S. (Croydon), H. (Norwich), J. A. W. K. (Glasgow), E. E. (Oldham), H. Y. C. (Redhill), J. G. (Bradford), F. R. B. H. (Gt. Yarmouth).


IL·PALAZZO·DELLA·GRAN·GUARDIA·
·VERONA·
½"·DETAIL·OF·FRONT·



MEASURED AND DRAWN BY LESLIE WILKINSON, A.R.I.B.A.
(R.I.B.A. Measured Drawings Medal, 1907-8.)

February 26, 1908. Volume 27, No. 681.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 364, Westminster.

Date of Publication: The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The "Concrete and Steel Section" is given in tais Issue.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

Disapproval of the County Hall Award.

The result of the competition for the London County Hall has aroused a strong feeling of disapproval among architects whose experience in dealing with the problem of monumental planning adds considerable weight to their opinion. It is evident from even a cursory examination of some of the designs submitted that many difficulties have to be surmounted (and much has to be learned) by an architect engaged during the greater part of his career in domestic or ecclesiastical work who is suddenly called upon to exhibit his skill in designing a large public building. Therefore, notwithstanding the general favour with which the award has been received by the professional journals, we prefer to accept the freely expressed judgment of the large majority of those architects whose practical *qualifications* compel attention. Although we are heartily in agreement with the greater portion of the criticism on the various designs which recently appeared in this journal, yet we are unable to endorse our critic's opinion as to the supreme merits of the successful one. Indeed, it seems to us that sufficient attention has not yet been directed to some of the many unsatisfactory features of the plan, whilst its architecture—and architecture is *not* as some architects insist, a "question of taste" or a mere "matter of opinion"—leaves much to be desired, as, in effect, our critic admits. On the whole, having regard to its, in some respects, antiquated system of planning, and especially in regard to the far too "fashionable" style of its elevations, it appears to us that the selection made will result in setting back the architectural clock for many years. We feel that in a competition for one of the most important buildings of our time, the profession and the public had an equal right to expect that the best design possible would be forthcoming. But without taking an over-sanguine view of the architectural possibilities of to-day, we confidently assert that the scheme selected for the London County Hall in no way approaches even the mediocre standard of design to which we are accustomed in an age remarkable for its neglect of art and for its strong spirit of commercialism. We should therefore welcome any remarks our readers may have to make on the subject of this competition, provided their communications are free from personalities, and express something more than mere unqualified dissatisfaction with the award. We are particularly disposed to represent both sides of the matter, as will be gauged from the reply, in this issue, to the adverse criticism of Mr. Knott's selected design which appeared in our columns last week.

The Employer's Burden.

A law case reported on another page of this issue illustrates very forcibly the liability which employers have to bear in respect of the use of chains on their works, and it shows also what unfair claims can be made, and sustained, even when the trouble arises out of the negligence of the workman employed. In the case in question a block of marble weighing 2 tons 6 cwts. was being hoisted, when a link gave way and the block fell on a workman, breaking his leg and crushing his foot. Now, the hardship in this particular case was that the employers had to pay compensation despite the fact that they had taken special care to have the best chains, and to see that they were tested by one of the most reliable firms in the trade; and despite the fact also that the accident was entirely due to the workman putting the chain to heavier use than he should have done. It appears that there were no fewer than eleven other chains on the premises capable of carrying 10 tons, and marked as such; yet the workman chose to use this smaller chain, which consequently broke and caused the accident. Every fair-minded person will at once admit that proper precautions should be taken to protect the workman in his employment, but this very provision has created a carelessness on the workman's part which often bears very hard on the employer, who, as in the present instance, may be held liable for what is no fault of his own.

Architects' Remuneration and the Institute Scale of Charges.

The case of *Horton v. Hemsley*, reported in another column, raises the question whether the scale of remuneration for an architect's services, as laid down by the Royal Institute of British Architects, is binding in all cases, in the absence of a special agreement. The circumstances out of which the case arose need not be repeated here, but we would briefly state that the plaintiff, an architect, claimed remuneration for designing and supervising the construction of a building, and compensation for the discontinuance of his employment, the claim amounting in all to the sum of £6,000. The defendant pleaded that he was justified in discontinuing the contract, as the plaintiff had failed to fulfil his obligations as an architect, and that the plaintiff had already been sufficiently remunerated by £1,000 already paid to him, or, in the alternative, by that sum and a further of £760 which the defendant paid into Court. By applying the Institute scale, the plaintiff claimed a sum equal to 4 per cent. on £122,500, together with some extra charges, but the Official Referee would not allow this, as the plaintiff had agreed to do the work at 3½ per

cent., which he considered was an adequate and sufficient remuneration: and after a careful perusal of the details of the claim we have come to the conclusion that the decision arrived at by the Official Referee was a perfectly fair and sound one, this being a case in which the Institute scale could not possibly apply.

The Grouting Machine. The thanks of the architectural profession are due to Mr. Francis Fox, M.Inst.C.E., for the extremely able paper which he read before the Royal Institute of British Architects on February 17th, as reported in our issue for last week. The object of the paper was to bring under the notice of architects a new method of repairing old walls, and investing them with the maximum amount of strength at the minimum of cost, by the use of the appliance known as the grouting machine. We are quite in accord with the opinion expressed by more than one well-known architect that Mr. Fox's paper was one of the most instructive, practical, and useful papers delivered during recent years before the members of the Institute.

RAILWAYS AND THE BUILDING TRADE.

By **H. Morgan Veitch,** *solicitor to the Joint Railway and Parliamentary Committee on the "Perishables" Trades.*

The apathy which is being displayed by most of the trades in this country with regard to the Board of Trade Conference now proceeding between selected representatives of British railways on the one hand, and British traders on the other, is somewhat remarkable; having regard to the vital issues at stake, the reason clearly is that the importance of the subject is not yet fully appreciated.

Most traders have recently seen short paragraphs in the daily press announcing that the Conference has already held its first sitting, but it is obvious that few have yet realised how nearly the matter affects themselves from the financial point of view. This would seem to be especially true in the case of that vast section of the community whose interests are more or less dependent on the prosperity of the building trade. A few notes on the subject therefore may prove useful.

It should be explained in the first place that the Conference has been convened by Mr. Lloyd George to discuss the complaints raised with regard to the present condition of affairs between the railway companies and the traders of this country. The former contend that the rates which they are now allowed to charge are not sufficiently remunerative, having regard to the increased cost of material and labour, while traders urge that the rates charged by the railway companies for carriage of goods are already too high, and that many of these rates actually stifle trade instead of encouraging its expansion. It is pointed out that any attempt to force up rates must in the long run prove injurious, not only to trade, but to the railway companies themselves, and traders contend that in exchange for the monopoly granted to the companies by Parliament (which, to a large extent, places the commerce of the country at their mercy) they must see that their functions of distribution are properly performed at reasonable charges.

Of the fact that the railway companies are now combined in a determined attempt to increase their rates at the expense of the trader, there can be no doubt. For some time past they have been acting in concert by means of the "Railway Companies' Association," which, for these purposes, combines the various railway lines into one great monopoly.

If evidence of the intention to force up freight charges is desired, convincing proof will be found in the report of the special meeting of the Railway Companies' Association held in London on January 17th last, when approval was given to "a proposal to promote a conference with a view to raising and adjusting the existing railway rates."

Since then, events have moved quickly, and a meeting of the Conference was held some days ago at which the future course of business was decided upon. Mr. Lloyd George, as chairman, has the assistance of three officials who will presumably adopt an independent attitude, namely, Mr. Hudson Kearley, M.P. (Parliamentary Secretary to the Board of Trade), Mr. H. Llewellyn Smith, C.B. (Permanent Secretary), and Mr. G. R. Askwith, K.C. (Assistant Secretary in charge of the Railway Department).

The railways are represented by the following general managers:

- SIR C. J. OWENS (*South Western Railway*)
- MR. A. BEASLEY (*Taff Vale Railway*).
- MR. A. K. BUTTERWORTH (*North Eastern Railway*).
- MR. SAM FAY (*Great Central Railway*).
- MR. W. GUY GRANET (*Midland Railway*).
- MR. J. C. INGLIS (*Great Western Railway*).
- MR. W. F. JACKSON (*North British Railway*).

Ten further delegates have been invited by Mr. Lloyd George to attend the Conference as representing other interests involved, including those of the trading community, namely:—

- MR. FRANK FORBES ADAM, *ex-president of the Manchester Chamber of Commerce.*
- SIR W. T. LEWIS, *a large coalowner.*
- MR. W. BURTON, *general manager of an important firm in the Potteries.*
- MR. RATCLIFFE ELLIS, *Secretary, Coalowners' Association.*
- MR. O. D. JOHNSTON, *representing agriculture.*
- MR. W. H. MITCHELL, J.P., *vice-president, Associated Chambers of Commerce.*
- MR. ALFRED MOND, M.P., *of Messrs. Brunner, Mond and Co.*
- MR. E. MOON, K.C.
- MR. ALEXANDER SIEMENS, *of Messrs. Siemens Bros. and Co.*
- MR. J. A. SPENDER, *Editor of the "Westminster Gazette."*

It may perhaps be contended that several of the traders' representatives mentioned above have some knowledge of the conditions of the building trade, but it is greatly to be regretted that the President has not seen his way to invite the attendance of someone specially qualified to represent the building interest, and to press for rectification of its grievances. If the interests of the building trade are overlooked, or misunderstood through want of sufficient representation at the Conference, the effect will be most serious. Increased cost of material, unless it is to be borne wholly by the manufacturer or the builder, must eventually involve higher rents (especially as regards weekly property), as well as higher assessment for taxation; so that the general interests of the community are thus affected. Furthermore, the number being so limited, it is obviously impossible for every trade to be represented. For this reason a delegate from the building trade would greatly strengthen the Conference, since he could speak from practical experience of the conditions of traffic for material manufactured by at least a dozen different trades. It is earnestly to be hoped, therefore, that the President of the Board of Trade may see his way, even at the eleventh hour, to invite some specially qualified representative of the trade to attend the Conference. Failing this, the trade will be thrown back on the much less satisfactory course of supplying information as to its needs and grievances to those representatives who are already preoccupied on behalf of the other trades which they represent, and it is reasonable to assume that those trades which are best represented will secure the greatest concessions for themselves.

The deliberations of the Conference will undoubtedly lead to legislation by the Government at an early date, and the result will affect the trade of the country for at least another generation to come. The present class rates were fixed nearly twenty years ago, pursuant to an Act passed in the year 1888, and it may be at least as long again before the alterations now contemplated are once more varied.

Clearly there is no time to be lost, and, in response to the invitation of the Editor of this journal, the writer ventures to suggest that the following practical steps should be taken without delay:—

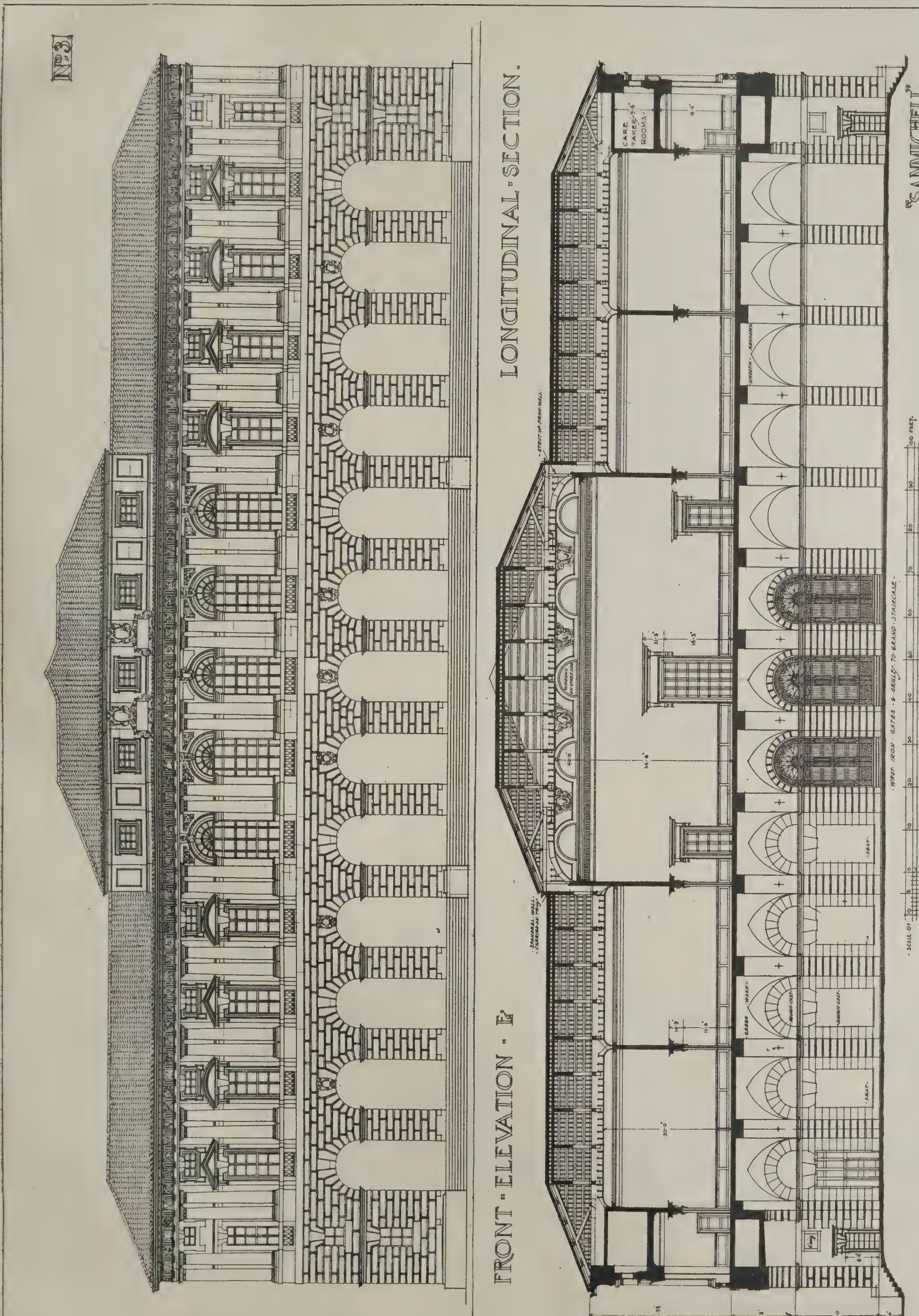
(1) A strong committee of those who are specially acquainted with railway rates and railway conditions should be formed to approach the President of the Board of Trade, and generally to adopt a settled plan of campaign.

(2) Those who are able to furnish concrete instances of hardship suffered at the hands of the railway companies should at once forward details to the Editor of this journal, giving, as far as practicable, precise particulars as to dates and figures involved. Examples of grievances in respect of high railway charges, unfair owner's risk conditions, careless handling of goods, refusal of just compensation in respect of same, want of proper facilities, or undue preference shown to trade competitors, would be especially useful.

(3) The attention of members of Parliament should be called to the claims of the building trade in this connection

Traders must, of course, be prepared to work out their own salvation, but with proper co-operation there should surely be no difficulty in convincing those in authority that, even if increased income is necessary for the railways, the interests of the building trade must not be sacrificed, and that if higher rates are to be imposed they must be borne by some trade which is better able to stand the extra strain involved.

[NOTE.—For the purpose of assisting those who have not the time or opportunity to make themselves practically acquainted with railway matters from the trade point of view, arrangements have been made for further articles on this subject.—ED. B.J.]



THE GRAN GUARDIA VECCHIA, VERONA. MEASURED AND DRAWN BY LESLIE WILKINSON, A.R.I.B.A. (*R.I.B.A. Silver Medallist, 1907-8.*)

MR. RALPH KNOTT'S SELECTED DESIGN FOR THE LONDON COUNTY HALL.

In our issue for last week we reprinted an adverse criticism of Mr. Ralph Knott's selected design for the London County Hall, written by an "Architect" contributor to the "Daily News." We now have, in fairness, to give the following reply to that criticism, written by "A Brother Architect":—

"No one will admit, and I should suppose least of all would Mr. Knott, that his design is perfect. But I do say that his plan touches the spot in a way that no other competitor's plan has done.

"Taking the points of criticism as raised by your correspondent:—

"(a) The impossible wings advancing on the river front. Well, look at them again. If the two pavilions were reduced in their advance there would still remain two apartments which, in point of spaciousness and accessibility, would still compare more than favourably with the other schemes.

"(b) The Council Chamber suite of apartments and the grand entrance. Yes; they are not palatial, but they are eminently practical, and I don't think we need trouble about the sample crowd, etc.

"(c) Unlighted corridors. If this criticism could be sustained it would be a serious one. The point is, will those corridors be dark? I think not. With glass doors to the several rooms on either side acting as borrowed lights I submit these corridors of working offices are business-like and satisfactory.

"(d) As to the elevations. The writer says: 'They are a pale reflection of Mr. Norman Shaw.' I should not have said so; but if they are, Mr. Knott has taken one of the ablest men among us as a model. If you put it to me in that way, I should have to say that with a few exceptions there is nothing strikingly new in any of the designs so far as elevations are concerned.

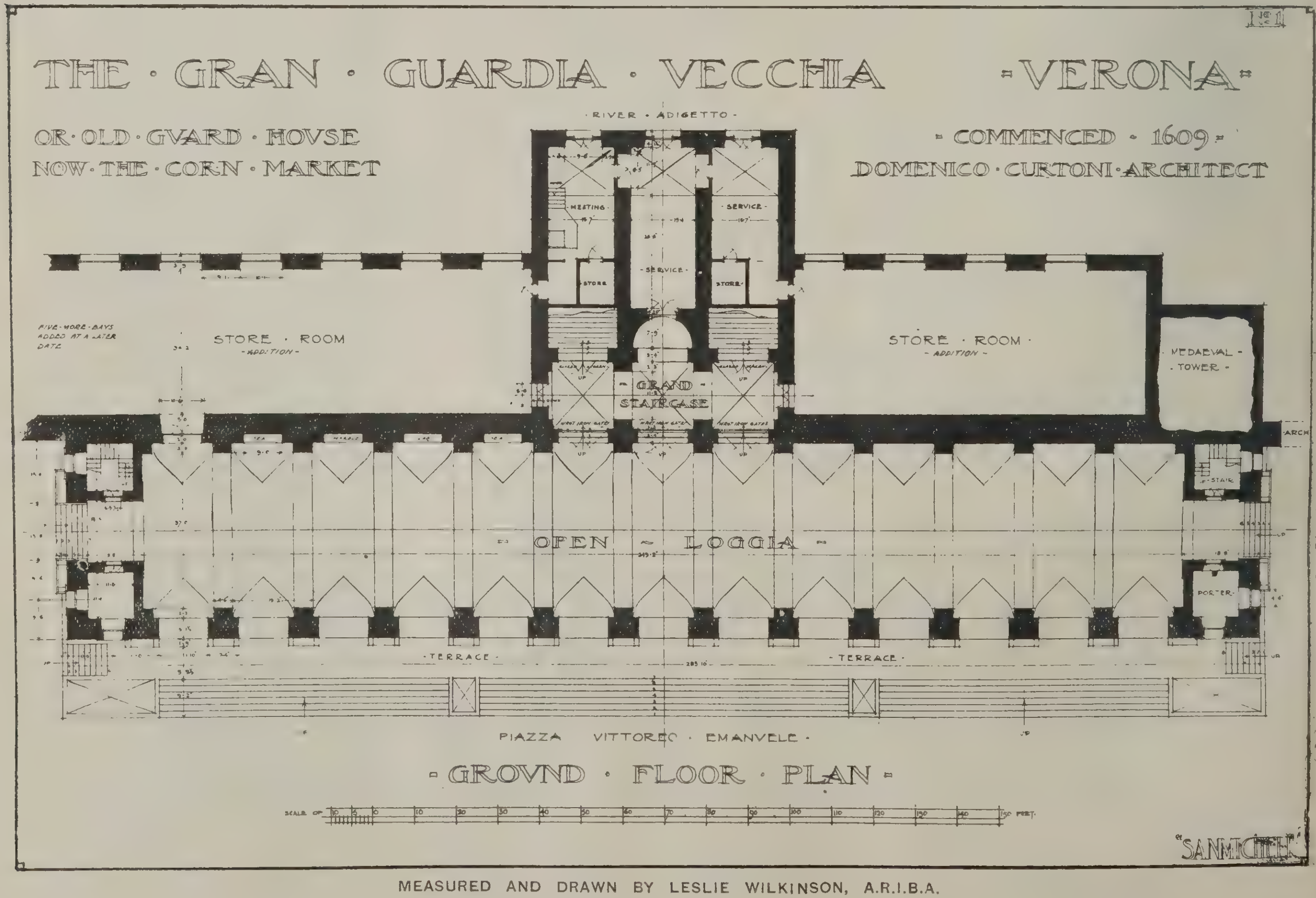
"This is a case where, say what you will, the winning architect has evolved a plan that has knocked out all other competitors. And his elevations show the architect to be quite capable of expressing himself well in this way also. Though I, for one, am not a believer in comparative youth jumping through the hoop the first time, I do most heartily congratulate Mr. Knott, who is quite a stranger to me, and I wish him the greatest success in his work."

Professor Reilly wishes us to correct the statement in the short account of his Manchester lecture on "The Grand Manner" published in our issue for last week, where he is reported to have praised Mr. Knott's plan for the London County Hall as an example of the grand manner in architecture. Professor Reilly writes to say that this is the exact reverse of what he really said. It was the plan of Messrs. Lanchester and Rickards, laid out in the spacious classical way, and combining the many diverse parts of a building into one harmonious whole, which he cited as an excellent modern example of the Grand Manner. He added that it was just this quality which was conspicuously absent from Mr. Knott's plan; and he said further that if Mr. Knott's was placed first by the assessors on the score of cheapness below the sum stipulated in the conditions of competition, it was highly and obviously unfair. Our account was taken from the report published in the "Manchester Courier," which, we much regret, was inaccurate.

ENGLISH AND ITALIAN GARDENS.

Mr. T. H. Mawson read a paper on "English and Italian Garden Architecture" before the last meeting of the Leeds and Yorkshire Architectural Society.

On the Continent, said Mr. Mawson, the English are identified with a certain style of gardening where natural trees and grass predominate; the German at Munich, for instance, points proudly and knowingly to the spacious elms in the "Englichen Garten" luxuriating amidst green surroundings. But in the great Italian and French gardens one feels the presence of a complete and studied scheme. As exponents of the art and science of landscape gardening, French and Italian examples are distinctly superior to the English, though for lovable beauty nothing can approach the English garden. The charm of an English garden is the refreshing carpet of green grass; this is our most valuable asset, and where it is absent in quantity and in quality, the charm of an English garden is lost. In the Italian garden there is no such keynote, but the reverse. This is needfully so, because after the fierce sun of June the earth parches, and only a few extreme sun-delighting flowers (such as geraniums or a few sub-tropical flowers) continue to bloom throughout the remaining hot months, and these flourish best where they can gain a welcome shadow from a friendly wall or hedge; so that an abundance of adornment in the shape of walls, balustrades, fountains, became a necessity, and these supply the interest that grass and flowers yield in our home gardens. Magnificence and grandeur is what strikes one in an Italian garden, and homeliness and simplicity in an English garden.



MEASURED AND DRAWN BY LESLIE WILKINSON, A.R.I.B.A.

Notes on Competitions.

Small Houses, Ainsdale.

In connection with the cottage and bungalow exhibition which is to be held at Ainsdale, near Southport, from August to October next, 1st, 2nd and 3rd prizes of £50, £20 and £10 respectively are offered in respect of houses to cost £300 (Class I.) and £550 (Class II.). There is also an architectural section, in which prizes of £10 and £5 are offered in three classes—two of these classes being for houses costing £300 and £550, and the third class including the garden lay-out. The prizes will be awarded by a committee of three judges, nominated by the Liverpool Architectural Society, the Manchester Society of Architects, and the National Housing Association. Designs have to be submitted by June 1st next. Full particulars can be obtained from the Seaside Garden Village Co., 120, Lord Street, Southport.

New Municipal Buildings, Radcliffe, Manchester.

Fifty-four designs have been submitted for these buildings, which are estimated to cost £12,000. The assessor is Mr. Willoughby. It is expected that the award will be announced at the next Council meeting, on March 9th.

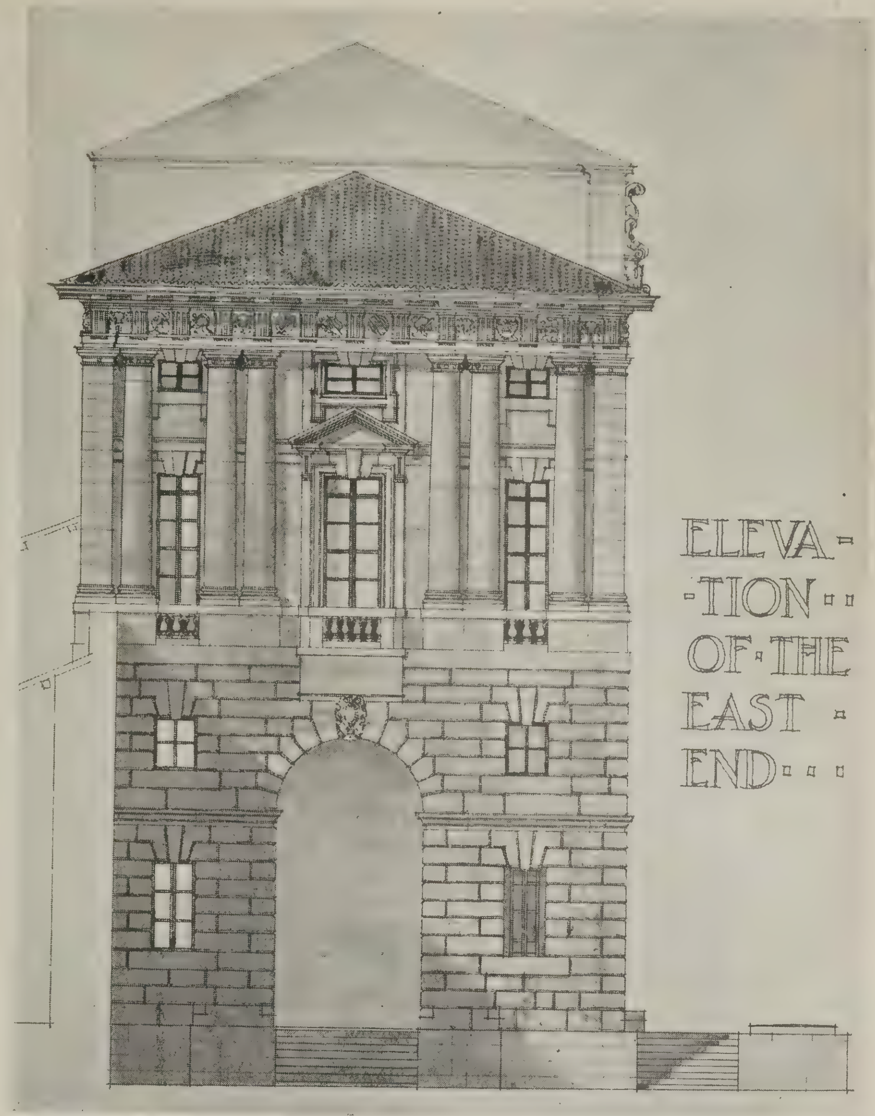
Castleton Branch Baths, Rochdale.

The Baths Committee of the Rochdale Corporation, assisted by Mr. A. Saxon Snell, F.R.I.B.A., of London, have awarded the premiums in this competition as follows:—1st, Messrs. Wallis and Bowden, of Westminster; 2nd, Messrs. Butterworth and Duncan, of Rochdale; 3rd, Mr. P. W. Hathaway, of Rochdale. Competitors can inspect the designs until March 2nd, between the hours of 10 a.m. and 5 p.m.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
Feb. 26	REBUILDING OF EBENEZER CHAPEL, GORSEINON.—£5 5s. offered for best plan: intending competitors to state their charges "for making out specifications and bills of quantities." Cost of work not to exceed £2,000. Particulars from Rev. D. H. Thomas, Gorseinon.
Mar. 7	SECONDARY SCHOOL AT LOWESTOFT.—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft. Deposit, 5s.
Mar. 13	SCHOOL AT FISHPONDS, BRISTOL for 600 children. Limited to Bristol architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport.



THE GRAN GUARDIA VECCHIA, VERONA.

THE GRAN GUARDIA VECCHIA, VERONA.

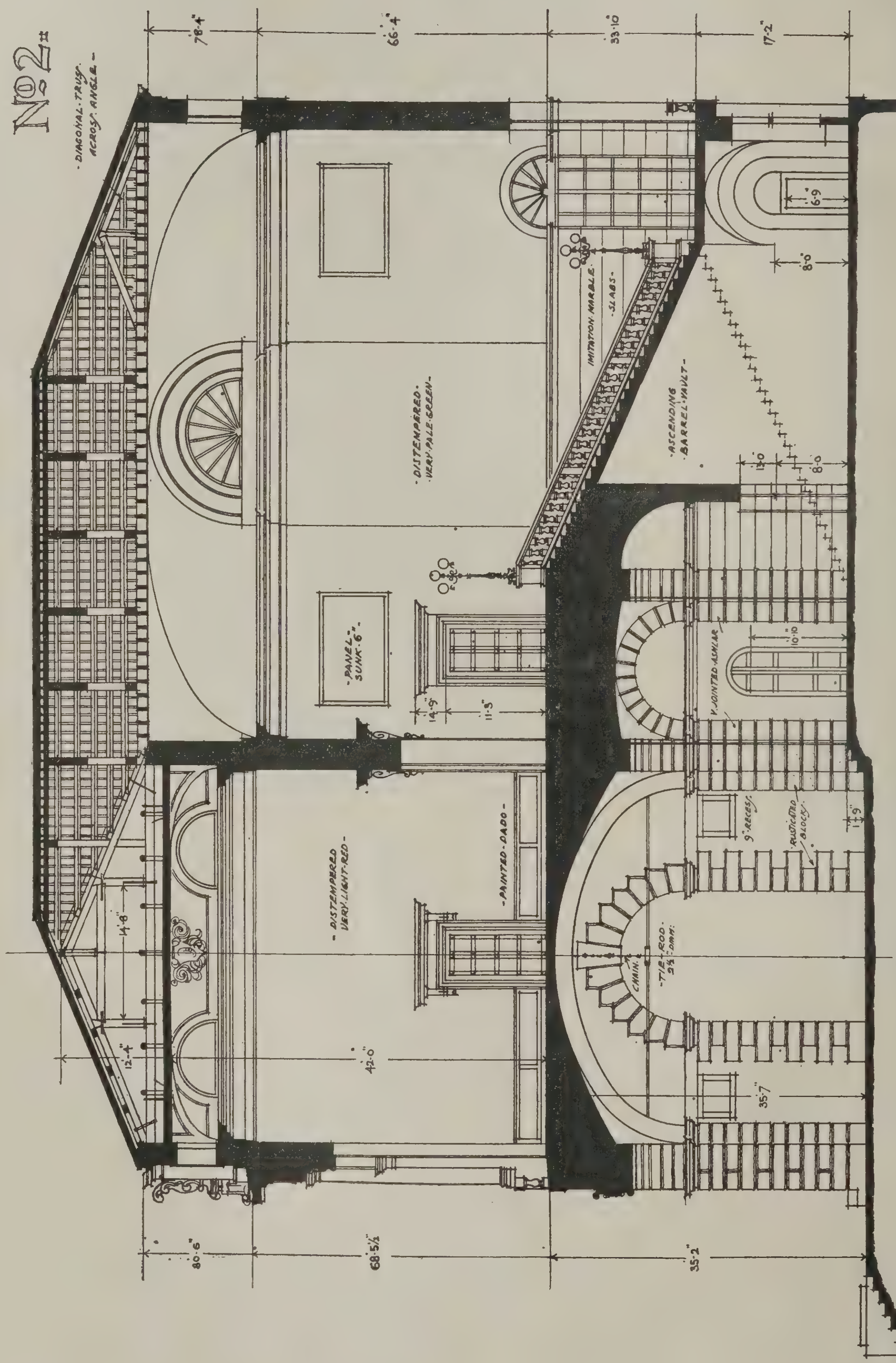
This building, the old Guard House (now the Corn Market) of Verona, was designed by Domenico Curtoni and commenced in 1609. The massive rusticated lower part, treated as a simple arcade nearly 300 ft. long, set on a stepped podium, the grand and decidedly military character of the upper storey, with its coupled Doric columns, the strength of the end bays, and the variety and grace of the shields, metopes, and other ornament, make it one of the finest buildings of its class in Italy. Throughout the influence of Sanmicheli's work in the same city is very evident. It is built of large blocks of stone of a pleasing warm brown colour, and roofed with red tiles; and forming, as it does, the west side of the irregular Piazza Vittoreo Emanuele, one of the largest piazzas in northern Italy, it can be seen to the very best advantage. The drawings of the building, by Mr. Leslie Wilkinson, which we reproduce in this issue were awarded the silver medal of the Royal Institute of British Architects this year.

THE ROMAN COLOSSEUM.

"The Roman Colosseum has seen changes—games, battle, blood, martyrdoms; then consecration, processions, the preaching of Capuchins, and the stations of the Cross; then the taking down of the Cross, the uprooting of wall-flowers, and the reign of excavation; then the cabstand outside the gate, the advertisements of hair restorers on the neighbouring walls, and the smell of the nearest gasworks flitting in upon the evening breeze. And now 'the wheel has come full circle,' for it is to be devoted to games again. The athletic clubs of Rome are to have the run of that great arena.

"The Colosseum is quite strong enough to watch the whole thing through again, if only—as seems likely—the one act not to be repeated should be the quarrying amongst its stones for the building of palaces. In its state of permanent and stable ruin the amphitheatre looks as though it would 'see the world to bed.' And what good, well-educated, refined, and English indignation has been wasted on that quarrying! Our zealous archæologists have grown violent in so excellent a cause. But is the cause really so good? The mediæval and Renaissance palaces built from its blocks are wonders of beauty and dignity; on them chiefly does altering Rome now depend for greatness and grace. And the Colosseum is, after all, but an ugly ruin, much like a dry Stilton cheese with one side broken; and it must have been ugly in the days of its wholeness—late, corrupt, inconsistent, and clumsy in architecture, a confusion of Greek orders misunderstood."—From the "Office Window" of "The Daily Chronicle."

NEW SOUTHAMPTON BUILDINGS.—The Local Government Board has sanctioned the application of the Southampton Town Council for power to borrow £5,200 for the erection of a central fire station. A new building, to cost £10,000, is to be erected on a site in Oxford Street for the Southampton Sailors' Home.



TRANSVERSE SECTION

THE GRAN GUARDIA VECCHIA, VERONA. MEASURED AND DRAWN BY LESLIE WILKINSON, A.R.I.B.A.

Law Cases.

ELECTRIC STREET BOXES AS "STRUCTURES."—The case of the *County of London Electric Supply Co. v. Perkins*, heard in the King's Bench Division of the High Court of Justice on February 12th, raised the point as to whether an electric street-box was a "structure" under the London Building Act, and whether, as such, it was necessary that a building notice should be served in respect of it. The supply company in question had constructed under the footway in Leather Lane a street box for electric cables, about 27ins. square internally, and 30ins. deep, built of brick, with a concrete bottom and an iron cover. This, it was contended on behalf of the respondent (the district surveyor for Holborn), brought it within the meaning of section 145 of the London Building Act, which says that "Where a building or structure or work is about to be begun then two clear days before it is begun . . . the builder or other person causing or directing the work to be executed shall serve on the district surveyor a building notice respecting the building or structure or work. . . . " The Lord Chief Justice, in giving judgment, said this was practically an appeal against the decision in the cases of *Charing Cross, etc., Corporation v. Woodthorpe*, and *Whitechapel Board of Works v. Crow*. The "structure" in the present case was very much smaller than in the two cases named above, but he was unable to say that a reasonable individual might not consider that such a thing as the one in question ought to be examined, and its size made no difference in that respect. He held, therefore, that this street-box was a "structure," and dismissed the case.

ARCHITECTS' FEES AND THE R.I.B.A. SCALE: IMPORTANT CASE.—In the King's Bench Division of the High Court of Justice the case of *Horton* v. *Hemsley* came before Mr. Muir Mackenzie, the Official Referee, on February 18th. This action, in which the plaintiff was architect of a building which the defendant was erecting, raised the question as to whether the scale of remuneration for an architect as laid down by the Royal Institute of British Architects was a binding scale in all cases in the absence of a special agreement. As reported in the "Times," Mr. Muir Mackenzie, in delivering his judgment, first pointed out that the circumstances of the plaintiff's employment were not quite ordinary, since in this case he had not, after preparing the plans, to act as the defendant's agent in supervising the work of an independent builder, but the defendant was himself an experienced builder, and was to have the plaintiff's plans for the building submitted to him, when the defendant was to obtain contracts for some parts of the work, while other parts he was to carry out himself. Turning to the question of the scale of remuneration, Mr. Muir Mackenzie said the general rule was laid down as follows:—If, after part performance of his work by an architect, the employer refuses to continue the contract of employment, the architect can recover all sums due for services rendered before refusal, and for what he has lost by not being permitted to complete the contract of employment; or the architect may treat the contract as rescinded, and recover the value of the services he has rendered. Continuing, Mr. Muir Mackenzie said that the plaintiff alleged that, in addition to some charges for extra work by reason of the defendant's refusal to go on with the contract of employment, he was entitled to remuneration on the scale prescribed by the Royal Institute of British Architects. "The judges, in directing juries, have repeatedly declined to be bound by this rule, unless this scale of remuneration has been expressly consented to, or it has been established that the owner has known that in employing the architect he would be charged in accordance with this scale. . . . . The plaintiff here claims, by applying the scale, a sum equal to 4 per cent. on £122,500, together with some extra charges. I do not adopt that scale for two reasons. In ordinary circumstances having regard to the fact that the defendant had built a large building in London before, and probably knew, or at any rate must be taken to have known, the scale on which architects base their charges, I should have been disposed to find that the defendant acquiesced in the scale so far as applicable. But in this case the defendant, as I find, never intended to be bound by the charges of the scale in employing the plaintiff. The plaintiff had offered to do all the work for a remuneration of 3½ per cent., and the defendant did not agree to employ him at a higher rate. Secondly, the scale, in the manner in which the plaintiff seeks to apply it, awards him a remuneration in excess of what is reasonable or just in the circumstances." The Official Referee therefore found that 3½ per cent. on the cost of the entire work, which he estimated at £90,000, was an adequate and sufficient remuneration and compensation in the circumstances of the case; and judgment for that amount, less £1,000 already paid, and £760 paid into Court, was entered for the plaintiff accordingly.

LIABILITY ATTACHING TO THE USE OF CHAINS.—Messrs. Marmor, Limited, of Fulham, were summoned recently under the Factory and Workshops Act for failing to comply with a Home Office regulation that a certain ½in. chain used for hoisting or lowering in connection with certain works had not been effectually softened by annealing or firing during the preceding six months; and for allowing the chain to be loaded beyond a safe load, whereby an accident occurred to a man named William Cuell. Mr. Harston, His Majesty's Inspector of Factories, prosecuted. He explained that on October 19th the defendants had a ½in. chain in use on a crane, which had been in use for 18 months. A block of marble weighing 2 tons 6 cwts. was being raised, when the chain broke and the block of marble fell on Cuell, breaking his leg and severely crushing his foot, as a result of which Cuell had not been able to follow any employment since, and would not be able to do so for some time. Mr. Ward, another of His Majesty's Inspectors of Factories, made an investigation, and found that one of the surfaces of the links which had been broken was of a highly crystalline structure, and showed that the chain had not been annealed for some time. As a matter of fact, the chain was last annealed on February 18th, 1907, while on November 26th, 1906, the chain was tested by Messrs. Brown, Lennox, and Co. A certificate was given that the chain had been tested up to 3 tons; the safe-working load was 1½ tons. The defendants should have known, then, not to have let it carry a weight of 2 tons 6 cwts., but the head slinger, Ashworth, and the assistant slinger, Cuell, had not been instructed either as to the safe loading limit of the chain or as to the weight of the marble they were raising. Mr. Pierron, for the defendant firm, pointed out that the chain was bought new three years ago from the best firm in the trade, and this was the first time anything of the kind had occurred on the premises, or during the 30 or 40 years Mr. Tomes, the managing director, had been in the trade. On November 26th, 1906, the chain was annealed and tested by Messrs. Brown, Lennox, and Co., who were the best firm possible for that kind of work, and it was again annealed in February, 1907, because of something that was noticed in one of the links. Mr. Pierron further pointed out that there were eleven chains on the premises which would carry up to 10 tons, and these were marked. He contended that it was through the negligence of the two slingers, of whom the injured man was one, that the accident occurred. They had been told to be careful and leave a good margin for the weights they lifted. The magistrate pointed out that special provision was made for prosecution by the employers for negligence in such cases by their men, but if the men had been negligent here the firm had not taken proceedings. It was stated that there had been a claim for compensation by the injured man, and this had been adjusted by payment of half wages to him. The magistrate imposed a fine of £10 and 8s. costs on the second summons, and a fine of 40s. and £1 costs on the first, which he thought was practically only a nominal matter.

AFFAIRS OF A WELL-KNOWN TRADING FIRM.—In the Chancery Division, before Mr. Justice Neville, on February 18th, the petition of Mr. William Nash, a shareholder, for the winding up of Frederick Sage and Company (1905), Ltd., was withdrawn on terms agreed to between the parties. Counsel said it was a petition by a contributory supported by a number of other contributories, who considered that, as things were, the best interests of the company would be served by winding it up. But they also thought that matters might be put into such a shape that the company might be placed again on a prosperous footing. Other persons concerned had fallen in with this view, and arrangements had been come to by all the parties interested with respect to a scheme of management which it was believed would result in the recovery of the company's past prosperity and success. The petitioner and his friends being satisfied that the company's business was a sound and valuable one, and that, in the altered circumstances, it had every prospect of success, asked leave to withdraw the petition on the terms agreed. His Lordship assented.

ACTON MUNICIPAL BUILDINGS: MR. HUNT'S ACTION FOR LIBEL.—In the King's Bench Division last week, Mr. Justice Darling and a special jury heard an action for damages for alleged libel and slander brought by Mr. W. G. Hunt, architect, against Mr. Schultess-Young, the well-known barrister. Mr. Lush, counsel for plaintiff, said that Mr. Hunt's allegation was that Mr. Schultess-Young had deliberately and repeatedly charged him at public meetings and at interviews with other people with bribery and with having corruptly bribed certain officials at Acton in order to obtain public employment. In 1902 Mr. Hunt secured a nomination to send in plans in com-

petition with others for new municipal buildings for Acton. His plans were awarded the first place. They were, however, modified at the suggestion of the Council. Tenders were invited, and the lowest was £80,900, the highest £87,000. The Local Government Board, however, declined to sanction a loan for that amount. Mr. Hunt was, however, paid his charges of £2,400. Then the plans were again modified in April, 1907, for municipal buildings to cost £35,000 and a town hall at £25,000. The plaintiff's contract for these buildings was to have been sealed on April 15th, the last day of the old Council's term of office. On that day Mr. Schultess-Young, as a barrister duly instructed by a solicitor, applied to Mr. Justice Sutton, *ex parte*, for an injunction to restrain the old Council from sealing the contract, and this was granted. The injunction came as a bombshell at the meeting. The next day the new Council, with Mr. Schultess-Young upon it, came into office, and the contract not being sealed, Mr. Hunt could not recover for his work. Counsel then proceeded to read extracts from the speeches of the defendant which were complained of. Mr. J. F. Shillaker, a member of the Acton Council, said that at a meeting of the Council he heard Mr. Schultess-Young make a statement to the effect that Mr. Hunt had paid £200 to Mr. Monson, junior, to get that gentleman's father to use his influence in getting a nomination to compete for the position of architect. Mr. E. J. Monson gave evidence to the effect that he assisted Mr. Hunt with the plans of the proposed municipal buildings. He said there was no foundation for the statement that Mr. Hunt offered him money to secure his father's influence in regard to a nomination to compete.—At the third day's hearing of the case, on Friday last, counsel stated that an arrangement had been come to between the parties, and a withdrawal of all imputations was made on both sides.—Mr. Justice Darling said the parties were to be congratulated on having taken so sensible a view of the question. He did not wonder at the misunderstanding which had arisen between plaintiff and defendant, but he hoped that the investigation which had been openly held would satisfy everyone that nothing wrong had been done, either by Mr. Hunt or Mr. Schultess-Young, or by the other people whose conduct was suspected. A juror having been withdrawn, the matter terminated.

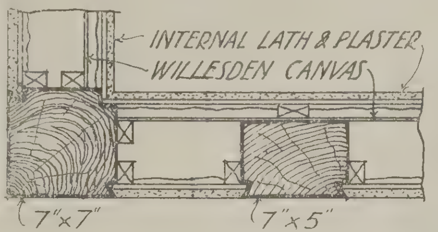
Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

Half-Timber Work.

SCEPTIC writes: "I am designing a house with a half-timbered (genuine) porch, with room above. Can a satisfactory wall be obtained by the use of studs and framing alone, *i.e.*, without the use of bricknogging, etc., as filling? I understand Willesden canvas can be used to advantage between studs."

It is quite possible to construct weathertight half-timber work without brick filling, but any such form of construction is prohibited by most local by-laws, which call for solid filling of brick-work between the timbers, and extending behind the same 4½ ins. in thickness. I do not consider Willesden canvas between the timbers particularly well adapted to the purpose. A better method would be to nail fillets to the sides of the timbers for lathing, and to plaster the exterior face flush with the framing. The interior could then be lathed and plastered in the ordinary way, or, if additional protection were required, could be



first covered with Willesden paper or canvas, and then counterlathed before plastering, as shown on the accompanying sketch. This form of cavity construction is quite reasonably successful in preserving an equable temperature, but if the cavity is objected to as harbouring vermin, it may be filled with slag wool pugging. G.

Tests for Mortar.

LONDON.—W. E. H. writes: "Can you state what are the best simple tests for mortar and plaster (a) on the job, (b) such as could be applied at the office?"

So far as I know, there are no reliable tests for mortar in an office or on a building except by analysis and testing for adhesion and compression, both of which take time and are the work of experts. The character of the sand used in making mortar is to a large extent a criterion of the mortar from which it is made, and the same with plaster of Paris. Millar, in his book on plastering, says it may be tested by squeezing it in the hand after mixing with water; if it keeps in position after the hand has been gently opened, it is good plaster; if otherwise, it is of inferior quality, or has been injured by damp. The quality cannot be determined by colour, as the latter depends on the colour of the gypsum stone from which it is made, nor by time of setting, although slow-setting plasters are considered the best. If a small quantity of coarse plaster is dropped into a tumbler of water and it falls to the bottom, this is *prima-facie* evidence of the plaster having been improperly burned. T.P.

Cast of Roman Scroll.

LONDON.—C. H. L. writes: "Can you tell me whether the cast of the double Roman scroll from Trajan's Forum can be found in any public museum or collection in London? There is a shaded illustration of it in Glazier's book on Ornament."

A cast of the Roman scroll from Trajan's Forum, illustrated in Glazier's "Historic Ornament," may be seen at the Royal Architectural Museum, 18, Tufton Street, Westminster. It hangs at the back of the top gallery.

Geometrical Drawing for R.I.B.A. Preliminary Examination.

WALLASEY.—B. T. L. writes: "Would 'Practical, Plane and Solid Geometry,' by J. Harrison, A.M.I.C.E., of the Royal College of Science, London, be a suitable book for the questions on practical and theoretical geometry set for the R.I.B.A. preliminary examination?"

The book you name, or any other good text-book, would be suitable for use in preparation for this subject in the R.I.B.A. preliminary examination. Other suitable books are "Practical Plane Geometry," and "Descriptive Geometry," by J. F. Heather, both published in Weale's series. In addition to purely theoretical questions, it is usual for the examiners to set some questions dealing with simple architectural problems, such as a staircase or a small building, for which text-book knowledge alone will be insufficient. G.

Drying a New House.

CHESHIRE.—F. J A. writes: "Is there any method of testing whether all the dampness has gone out of a new house? I have just finished a house, and having had the same dried by the 'Turk' system (which seemed very effective), I made all arrangements to go in. My doctor however strongly objects to my going in for some months."

I think you would be able to tell whether the house walls were still damp by visiting the premises after one of the present frosty nights, when, if the house is not thoroughly dry, you will find the walls moist and the window-sashes wet. I advise you to open the windows and secure a draught through the rooms every fine day; you will find this even more efficacious than fires. F.S.I.

So far as the "Turk" system is concerned, similar methods have been used in Germany for many years past, and, so far as our information goes, they are thoroughly satisfactory.

Architectural Perspective.

BEXHILL-ON-SEA. — SCEPTIC writes: "Can you mention a good practical handbook on architectural perspective, with information on quick methods of setting up?"

"The principles of Architectural Perspective," by Mr. G. A. T. Middleton (Batsford, 1903), explains the orthodox short methods of setting-up as used in practice. A special method, known as "R's Method," is explained in a book by the inventor, Mr. H. W. Roberts (which book is also published by Mr. Batsford).

Land Surveying.

HEREFORD.—K. H. writes: "Can you recommend a book dealing with the Colonial system of land surveying, including computation of areas and the use of co-ordinates, which would cover these subjects sufficiently for the Colonial Government surveyors' examinations?"

So far as the writer is aware there is no book on Colonial land surveying, but a book very suitable to your purpose, and for surveying purposes generally, is "Surveying as Practised by Engineers and Surveyors," by J. Whitelaw, jr. (published by Crosby, Lockwood and Sons, 7, Stationers' Hall Court, Ludgate Hill, London, E.C.).

New Buildings in London.

ZAMBOK writes: "I am desirous of spending two or three days in London to view the most up-to-date buildings, and shall be glad to know what you consider the best examples of the different classes."

We regret that we cannot afford the space which would be occupied in answering your enquiry. We suggest that if you will consult the special issue which we published last Christmas, you will find all the chief new London buildings illustrated.

THE ARCHITECTURAL ASSOCIATION.

Mr. Edward Warren on "Oxford."

A meeting of the Architectural Association was held on Friday evening at 18, Tufton Street, Westminster, the chair being occupied by the president, Mr. Walter Cave.

The election of Mr. H. D. Kidd as a member of the Association was announced.

A vote of thanks was passed to Mr. A. H. Ryan-Tenison for presenting to the reference library a folio copy of Wren's churches by Clayton, together with a donation of one guinea to the library fund.

Mr. Edward Warren, F.R.I.B.A., then read a paper on "Oxford."

After making reference to the early history of the city, Mr. Warren went on to speak of the existing architectural remains.

Of Oxford before the Norman Conquest in 1066, he said there was not much that actually remained, but there were a few Saxon and very early Norman fragments, the most conspicuous of which is the tower of St. Michael's Church, close to which stood the North Gate, or Bocardo, destroyed in 1771; this seems to have served as a watch-tower connected with the rampart on the city wall. The tower of St. Michael's is thoroughly in the Saxon manner, built with battering walls of rough rubble, without buttresses, and showing the typical long and short quoins at the angles; this tower still retains the characteristic windows with mid-wall shafts or mullions and the heavy abacus whose length corresponds with the depth of the arches.

Of Norman work there is still something to show, though much has been destroyed or altered out of recognition in succeeding centuries. The nave and choir of the Cathedral, now bearing an elaborate fan-vaulted 16th century roof, are Norman, and are probably part of the work carried out by Prior Guimond in the latter half of the twelfth century.

Another Norman building was the Castle, but the only remaining portion of this is the tower of the church of St. George which was built within the walls. One of the finest instances of Norman architecture in England, however, is Iffley Church, about two miles from Oxford.

Mr. Warren then went on to refer to Oxford in the Middle Ages, to the religious houses, and finally to the colleges. He dealt with the last-named in chronological order.

The following table furnishes the chief architectural facts:—

Approximate Chronological Order of Buildings from the Norman Conquest to 1800. Taken from "Oxford" by H. J. L. J. Massé, M.A.

Saxon Work.

The wall at the east end of the choir in the cathedral. Possibly the westernmost portion of the crypt at St. Peter's-in-the-East.

Norman Work.

The remaining tower in the Castle, 1071. The tower of St. Michael at the north gate, part, 1074; part later, 1150. Chancel arch in Holywell Church, 1160. Door of chapter-house in Cathedral cloister (damaged by fire in 1190). St. Giles' Church, base of tower, 1138. The nave of the Cathedral (1140—1180). Clerestory in transept, 1180. Crypt of St. Peter's-in-the-East, part of the chancel, south doorway, corbel table, 1170.

(Iffley Church, with its recessed arch, zig-zag and other mouldings, *c.* 1160, should be visited by any student of English architecture.).

Transitional.

North and south aisles of St. Mary Magdalen, *c.* 1194.

St. Giles' (very late, 1200).

Early English.

The well-chamber in the mound in the County Gaol precincts.

St. Giles' Church.—South aisle, 1260.

St. Peter's-in-the-East.—Arcade in nave, *c.* 1260.

The Cathedral.—Spire; chapter-house (1220); Lady Chapel (to the north of the choir); existing fragments of St. Frideswide's Shrine, 1289.

Church of St. Mary the Virgin. — The tower, 1280—1290.

Decorated.

Merton.—Chapel, 1277. Hall (the original), 1274; ironwork on door, 1320; library, 1276 (Bishop Rede).

Church of St. Mary the Virgin. — The spire completed 1310; Adam de Brome's Chapel, 1320.

Cathedral.—Latin Chapel, 1350.

St. Aldate's.—South aisle, 1336.

St. Mary Magdalen's Church.—Original parapet on south front, 1335.

St. Peter's-in-the-East. — North aisle windows, 1350.

Perpendicular.

New College, 1379—1386.—Chapel 1386; hall, 1386; cloisters, 1400; bell tower, 1400; quadrangle, third storey added, 1674.

Merton.—Ante-chapel, 1330—1414.

Balliol.—Old library, 1430.

Merton.—Entrance gateway, 1416; tower completed 1424—1450 (Bishop Kempe?).

Lincoln. — Tower; front quadrangle, 1431; hall, 1436.

All Souls.—College, 1437; chapel, 1442.

Divinity School, 1445—1480.—Slightly altered, 1669 (Sir Christopher Wren); panelled buttresses, 1450.

Old Schools.—Built originally, 1439.

Cathedral.—Vaulting of choir, 1480 *et seq.*

St. Mary the Virgin.—Nave, 1490—1503 (Sir R. Bray). The windows in the north side of Adam de Brome's Chapel, 1510.

Brasenose.—Buildings begun 1509. Third storey added to front quadrangle about a century later.

St. Mary Magdalen's Church. — Tower completed 1530.

Magdalen, 1475—1481. — Founder's quadrangle; cloisters, 1473; chapel, 1480; chapel tower, 1492—1505.

Corpus Christi, 1513. — Hall, finished 1516; chapel, 1517.

Christ Church.—Part of the great (Tom) quadrangle; hall, 1528—1530.

Jacobean

Jesus College, 1621—1626. — Chapel, 1621.

St. John's.—Cook's Buildings, 1613; enlarged, 1638.

Merton. — Dormer windows in Mob Quadrangle, 1603—1625; Fellows' Quadrangle, 1608—1610.

Wadham, 1610—1613.

Bodleian Library.—East wing, 1610 — 1613 (Holt).

Trinity.—The hall, 1618—1620.

Botanical Gardens.—Entrance gateway, 1632 (Inigo Jones).

Schools.—Quadrangle rebuilt, 1613 — 1618; Convocation House, 1634—1639 (Laud).

St. Mary's Church.—Porch, 1637.

Lincoln.—The chapel, consecrated 1631.

University, 1634—1675. — First quadrangle, 1634; chapel, 1639—1665; hall, 1640—1657.

Oriel Chapel (rebuilt).—South and west sides of quadrangle, 1620; hall, 1637; chapel, 1640—1642.

Christ Church.—Vaulting over the staircase to the hall, 1640 (Smith).

St. Mary Hall. — Hall, 1632—1644*; chapel, 1640.

Brasenose. — Library, 1663 (Wren); chapel, 1668 (Sir C. Wren).

St. John's.—Laud's Quadrangle, 1661—1635; library (addition by Laud), 1631 (often attributed to Inigo Jones).

St. Mary's Church.—South porch, 1637.

Sheldonian Theatre (Italian), 1664—1669 (Sir C. Wren).

Trinity. — North wing of the Garden Quadrangle, 1665 (Sir C. Wren).

Christ Church. — Completion of Great Quadrangle, 1665.

New College.—Garden Quadrangle, finished 1684.

St. Edmund Hall.—Chapel and library, 1680—1682.

Ashmolean (*Old*) *Museum,* 1679—1683 (Thomas Wood, sometimes attributed to Sir C. Wren).

Christ Church. — Tom Tower (upper portion of), 1682—1684 (Sir C. Wren).

Trinity. — Chapel, 1691—1694 (Dean Aldrich and Sir C. Wren).

All Saints' Church, 1700—1708 (Dean Aldrich), 1713.

Corpus Christi College. — Turner's Buildings, 1706 (Dean Aldrich?).

Oriel. — Garden Quadrangle, east side, 1719; west side, 1730.

Clarendon Building (Vanburgh? Hawkesmoor).

Queen's College.—Front, in High Street, 1750—1756 (Wren?) front quadrangle, 1710 (Hawksmoor); chapel 1714—1719; hall, 1704—1714 (Sir C. Wren).

Christ Church.—Peckwater Quadrangle, 1705 (Dean Aldrich); library, 1716—1761 (Dr. G. Clerke).

All Souls. — The Twin Towers, 1720 (Hawkesmoor); Codrington Library, 1720—1760; hall and buttery, 1729 (Dr. Clarke); cloisters, 1734.

Radcliffe Library.—1737—1749 (James Gibbs).

Magdalen.—New Buildings, 1733—1735 (Holdsworth).

Worcester. — Chapel and hall, 1784; front, 1760; new buildings, north side of quadrangle, 1753—1773.

Christ Church.—Canterbury Gate, 1778 (Wyatt); Canterbury Quadrangle, 1775—1783; staircase to hall altered (Wyatt).

Oriel.—Library, 1788 (Wyatt).

Lincoln.—New buildings in the "Grove," 1759.

Merton.—Hall ruined 1800 (Wyatt).

Notes on the Colleges.

Mr. Warren gave a series of notes on each of the Oxford Colleges and University buildings. The following is a summary of the chief points.

Merton.—Probably the oldest of the colleges, and possessing the stateliest chapel in Oxford.

New.—The type *par excellence* of the 15th-century monastic college, its only rival at Oxford, as a complete exemplar of Collegiate Gothic beauty, being Magdalen.

Balliol.—A very old college, but, unfortunately, with little of its ancient buildings remaining. It possesses, however, the fine old library, built between 1430 and 1480, and the old dining hall (1432).

All Souls.—Possesses in its ante-chapel some most beautiful 15th-century glass—in Mr. Warren's opinion, the most interesting in Oxford. Hawksmoor's great quadrangle is splendid in proportion, but its buildings are in the dismal mock Gothic of George I.'s reign.

*Now a junior common room for Oriel College.

Magdalen.—The chapel, internally, has been spoilt by ill-designed screen and stalls and very bad glass, which imparts an unnecessary gloom to the interior; externally, however, it has the well-known and very beautiful west doorway.; The hall was re-roofed a short time ago under the direction of the late Mr. G. F. Bodley.

Brasenose.—The architecture of this college, and particularly that of the chapel, presents a singular medley of Gothic and Classic. The chapel (1668) and the library (1663) are both attributed to Wren.

Corpus.—The front quadrangle has suffered, like that of New College, by the addition of a storey on two of its sides. The chapel has an altar-piece by Rubens.

Christ Church.—The largest college in Oxford. Its hall is 115ft. by 40ft. by 50ft. high, forming the south side of the great quadrangle, 264ft. by 261ft., with its familiar "Tom Tower" (by Wren): "the admirable harmony of Wren's domed belfry of 1682 with the Tudor gateway below is a striking instance of the genius of that great man." The staircase leading to the hall has an elaborate fan-traceried vault—an amazing instance of complicated Gothic work accomplished about 100 years out of date.

Exeter.—The chapel of this college, which was built in 1623, was pulled down to build the present incongruous imitation of the Sainte Chappelle at Paris, by Sir Gilbert Scott. It contains the tapestry of the Adoration of the Magi, designed by Burne-Jones and carried out by William Morris, both distinguished members of Exeter.

St. John's.—This is not only one of the most beautiful colleges of Oxford, but has the most beautiful garden of that city of gardens. Of the buildings of the Canterbury Quadrangle, with their fine colonnades, and the beautiful east or garden front, Mr. Warren said: "There is, to my thinking, hardly a lovelier thing in Oxford, or in England."

Wadham.—This is the least altered and most homogeneous college at Oxford. The plan and the studied symmetry of design show the influence of the Renaissance, but all the detail is practically late Gothic.

Trinity.—Notable for the magnificence of its gates, both those in Broad Street and of the gardens in the rear. In the chapel are some magnificent carvings by Grinling Gibbons.

Queen's.—The most determinedly Classic of the colleges—handsome and interesting, with work by Wren and Hawksmoor.

Worcester.—The buildings are chiefly of the 18th century, and good examples of their periods. The chapel was decorated by Burges in 1864-70.

Notes and News.

The National Federation of Building Trade Employers.—At the recent annual dinner of the West Bromwich and District Master Builders' Association, Mr. A. H. Keeping, in proposing "The National Federation of Building Trade Employers," said the Federation had justified its existence if only by drawing up a form of contract that could be accepted by architects and builders, and by organising conciliation boards for the settlement of trade disputes. Mr. W. Wistance (Walsall), president of the Midland Centre of the National Federation, in responding, said the employees had been showing them a lesson in combination for a good many years, and the employers had to federate in their own interests. By the formation of conciliation boards he thought strikes would become a thing of the past.

* * *

The Peerless Rubber Manufacturing Co, Ltd. (late Anglo-American Rubber Co., Ltd.), of 58, Holborn Viaduct, E.C., has secured the contracts for laying with their interlocking rubber tiling the ground floor of the new Hamburg-Amerika offices in Cockspur Street and Messrs. Dewar's new premises in the Haymarket.

* * *

A New Primitive Methodist Church and Schools at Plymouth were opened recently. They have been designed by Mr. H. J. Snell, jointly with Messrs. Thornely and Rooke, and erected by Messrs. A. R. Lethbridge and Son, of Plymouth. The total cost has been about £10,000.

* * *

Foreign Cement Contract.—The Commercial Intelligence Branch of the Board of Trade has received from the British Consul at Christiania particulars of a call for tenders for the supply of 3,200 barrels of Portland cement for the Norwegian State Railways. Tenders are to be delivered at Christiania by March 6th. The conditions and specification may be seen by British contractors on application at the Commercial Intelligence Branch, 73, Basinghall Street, London, E.C.

* * *

A Memorial to Queen Victoria in Dublin was unveiled recently. It is placed on the lawn in front of Leinster House. Mr. John Hughes, R.H.A., was the sculptor. Her late Majesty is represented in a sitting position, on a pedestal. On the right is a wounded Irish soldier receiving a laurel crown at the hands of a figure of Erin, and on the left is a group representing Peace, whilst at the back is a figure of Fame. In addition there are three smaller figures of Science, Literature, and Art. The work has been carried out in Paris, and a French firm was responsible for the erection.

* * *

"Coatostone" and "Stone Stuc."—At a meeting of the Royal Institution held on February 14th, before a large attendance of members, several specimens of work were shown executed by the Coatostone Decoration Co., of 77, Mortimer Street, W., and the method of its application was fully explained by Mr. A. W. Neal, the inventor of "Coatostone" (liquid stone). It was pointed out how stone- or cement-faced buildings could be treated with this liquid, doing away with the griminess to be seen on facades in London and other large cities: attention was also drawn to its treatment on interior plaster walls for staircases, corridors, and lobbies, etc., to give a stone appearance. Wooden columns, plaster cornices, ornaments, iron balustrading, etc., were also shown after having been treated with "Coatostone," which gave them the appearance and durability of stone. Several very good specimens of ornamental "Stone Stuc," cast in blocks, were also exhibited: these were examined with great interest, the resemblance to carved natural stone being so close in colour and texture as to make detection almost impossible. Mr. Neal pointed out that "Coatostone" and "Stone Stuc" could be applied by the ordinary plasterer, and that the Coatostone Co. supplies the trade on wholesale terms. The staircases and corridors of the new Piccadilly Hotel are now under treatment with "Coatostone," and several other large contracts have been successfully negotiated.

* * *

The General Hydraulic Power Co., Ltd.—The 26th annual general meeting of this company was held on Wednesday last at Winchester House, Old Broad Street, E.C. The statement of accounts and balance-sheet for the past year was submitted. This stated the gross receipts of the London and Liverpool undertakings to have been £128,090, as against £126,461 in 1906. After providing £1,293 for the dividend on the preference shares, there will remain a balance of £52,612, out of which will be paid a dividend for the year at the rate of 6 per cent. on the ordinary stock. An interim dividend of 2½ per cent. having been paid, the present distribution will be 3½ per cent. The balance to be carried forward will be £4,612. In London the length of the Company's mains in the streets is now 160½ miles. The demand for the power supplied has continued to increase, but the net revenue for the year has been seriously affected by the greatly increased cost of coal. The expenditure on capital account during the year has been £27,114, principally for the enlargement of the pumping station at Falcon Wharf, Blackfriars (now in progress), the building of a reserve coal store at Rotherhithe, and the laying of additional mains to meet the requirements of consumers.

PHOTO-COPIES OF DRAWINGS ON TRACING CLOTH.

The deficiencies of the ordinary photocopy of a tracing are familiar to every architect in practice: the blue print, for instance, while it gives good clean white lines on a blue ground, cannot be coloured, and on that account is quite useless for many purposes: while the ferro-gallic process, though free from this defect—the lines being violet on a white ground—is very apt to give broken lines, or weak lines, with a speckled tint on the surface of the paper: moreover, with all these processes that require putting the paper into water, either hot or cold, or in some mild acid bath, there is bound to be a certain amount of shrinkage and deformation: so that the resulting copies are not exact, and measurements cannot be taken from them. To meet these defects, several special processes have been put on the market, and among these is one which calls for notice particularly in connection with copies on tracing cloth. This is "Velography," a process introduced by Messrs. Norton and Gregory, Ltd., of Castle Lane, Buckingham Gate, Westminster. The lines given by this process are remarkably clear and solid, with no tendency to rub off: in fact, "Velography" copies on tracing cloth are guaranteed to be in every respect as permanent as tracings made by hand with waterproof black ink. This result is achieved by the use of a tracing cloth specially prepared for the process. And not only are the lines sharp and permanent, but the cloth is thoroughly transparent and perfectly flat. We have had occasion from time to time to note the improvements in plan copying introduced by Messrs. Norton and Gregory, but of all these improvements "Velography" seems likely to have the most far-reaching effects. Readers who require further particulars about the process should write for a booklet on the subject published by Messrs. Norton and Gregory, which can be obtained free on application.

CONCRETE AND STEEL SECTION.

(MONTHLY).

THE NEW STADIUM FOR SYRACUSE UNIVERSITY.

By Ivar Kreuger.

It is probable that for no other people in history have athletic games and contests played such an important role as for the ancient Greeks and Romans. The big games and other competitions which were arranged by them from time to time aroused such an interest and enthusiasm as to make them national festivals, the importance of which it is difficult for later generations to realise.

We have striking evidence of these conditions in the many splendid stadia, circuses and amphitheatres which were erected for athletic purposes in Greece and throughout the Roman Empire. Many of these buildings excelled in magnitude and architectural beauty anything similar that has been accomplished in modern times. The Greek stadia are the oldest of these structures.

The most famous of the Greek stadia were those in Olympia and Athens. As were nearly all Greek stadia, the one in Athens was built in the shape of a horseshoe, semi-circular at one end and open at the other. The arena was 109 feet wide and 669 feet long, and contained fifty thousand (50,000) seats. Similar to the Stadium, but shorter in length, were the old Greek theatres, of which a great number existed. One of the most famous of these was the one in Syracuse in Sicily.

From the Greek stadium or theatre, the Romans developed their more elaborate circus and amphitheatre. The greatest of these circuses, the circus Maximus, at Rome, as finally enlarged, would seat, it is claimed, 380,000 spectators. It was 705 feet wide and 2,200 feet long. The Roman amphitheatres, which were mainly used for battles with wild animals, and for gladiatorial contests were much smaller than the circuses, and differed in plan from these structures in forming a complete ellipse. The best known is the Colosseum in Rome. In Nimes and Arles in the south of France, at Pola in Istria, and at Verona, and Pompeii in Italy, are, however, amphitheatres in a better state of preservation than the Colosseum.

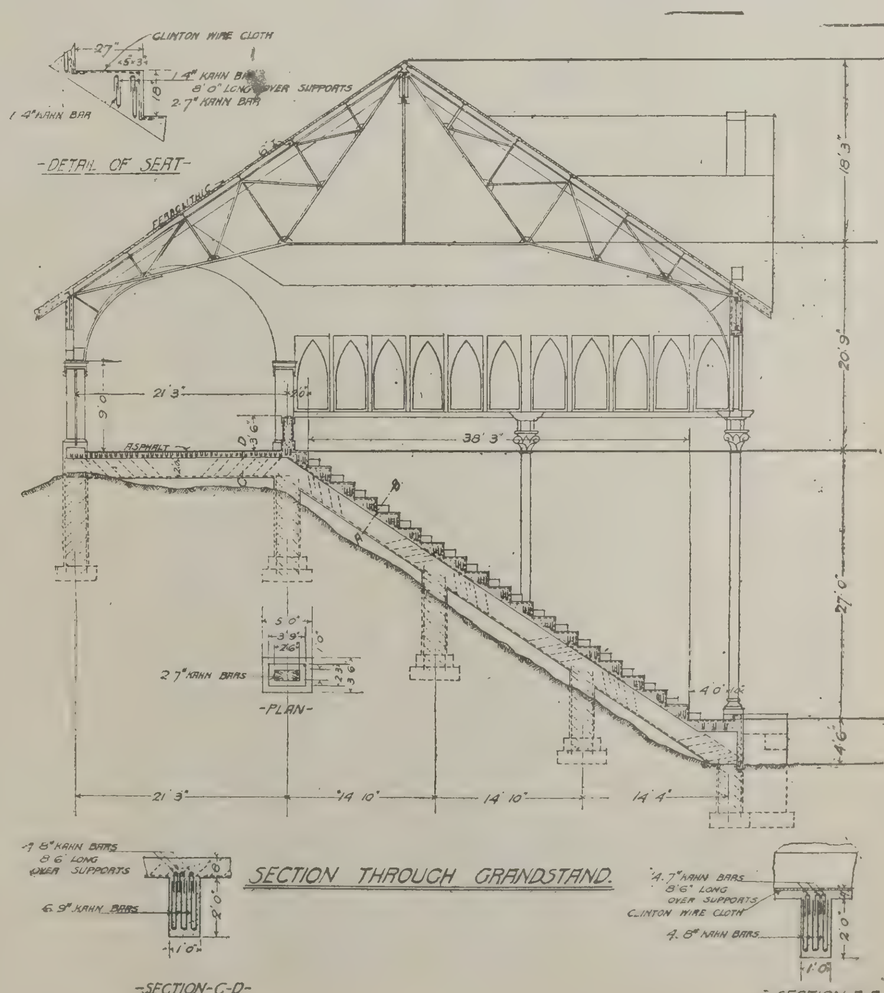
In modern times we have witnessed a revival of outdoor sports, and particularly at the Universities of America athletics is a feature of growing importance. It may be said, in fact, that no other regularly occurring events are followed with so universal an interest and collect such large crowds as the athletic contests between America's large colleges—especially the annual football games. There has therefore grown up a demand for a new type of building with large seating capacity and free from the dangers of fire and collapse. The demand has brought forward the modern fireproof stadium, built with the old Greek and Roman structures as models, but with the most modern of fireproof materials, reinforced concrete.

The first concrete stadium in the United States was constructed for the University of California in 1903. This building, though termed stadium, is more in the style of a theatre. It is, in fact, a reproduction of the old Greek theatre of Dionysus. More important and more like the old stadia in its construction is the one in Soldiers' Field at Harvard, which was built the same year.

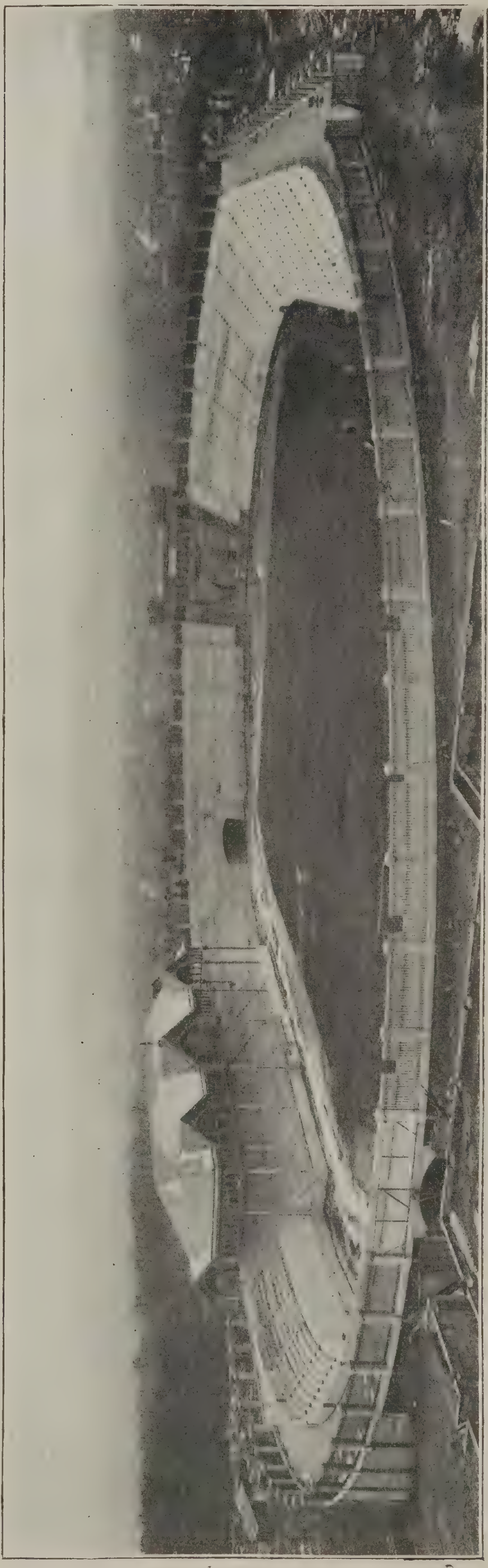
The latest addition is Syracuse University stadium, which has just been completed. There are probably very few universities which can boast of a location offering such attractive surroundings for the buildings as does the Campus in Syracuse. It is situated on a large height about one mile from the centre of Syracuse, and commands a fine view of the city and near by Onondaga Lake. The University grounds contain a number of hills on which are located the different college buildings, several of which are of a very monumental character. In the middle of the west side of the Campus the ground forms a large natural hollow, in which the new stadium has been erected. In plan it forms an oval, 475 feet wide and 671 feet long, with semi-circular ends, joined by a straight part 196 feet in length. The central part of the field is especially intended for football games, and is covered with turf. Outside of this turfed part is a running track one-quarter of a mile long.

In order to insure a good view of the races from every seat, the running track does not come close to the structure, but is separated from the same by a space 5ft. wide. Immediately outside of this space is a concrete wall, 5ft. high, extending 6ins. over, and forming a curb for a 4ft. walk, which runs around the structure. The elevation of this walk is 4ft. 6ins. above the field. Above this walk rise eighteen tiers of seats 18ins. high and 27ins. wide, to a level 31ft. 6ins. above the field. At intervals of 30ft. or 35ft. small steps 2ft. long, 13½ft. wide, and 9ins. high have been built on top of the seats, so as to form stairs. At the top of the seats is a concrete wall 12ins. thick and 3ft. 6ins. high. Opposite every row of steps this wall has an opening 4ft. wide. Outside of this wall is a 20ft. wide promenade of concrete, covered with asphalt. It is surrounded by a 2ft. wide concrete curb, on which rises an iron fence 8ft. high, between concrete posts about 18ft. apart. The rear of the concrete work is covered entirely by the ground which runs up to the level of the promenade, except at the west end, where it falls off suddenly to a level 35ft. below the promenade.

The stadium here has the character of a two-storey structure, with walls and piers of concrete. The central part projects slightly and forms two towers, between which two arches 40ft. wide form the main entrance. This leads to a platform from which there are stairs to the towers. These connect with the promenade from which the people are distributed to the seats.



THE NEW STADIUM FOR SYRACUSE UNIVERSITY, U.S.A.



THE NEW STADIUM FOR SYRACUSE UNIVERSITY, U.S.A.

Outside the main entrance is a large cement platform from which an 80ft. wide approach, also of cement, leads down to a street 23ft. below the level of the athletic field. Four smaller entrances direct to the promenade are provided by continuing straight for a distance beyond the rest of the structure, as will be noticed from the plan.

The grand stand is located on the south side, and occupies the whole straight part of same, 196ft. in length. It is covered by a cement roof, supported by steel trusses and columns. On both sides of the grand stand for a distance occupying 45 deg. on the circle, the ten lower tiers of seats are omitted, and a retaining wall 20ft. high forms the interior part of the concrete work. This arrangement was made in order to obtain a straight track for 220 yard races, which made it necessary to build two tunnels, through which the track continues outside the stadium proper. At the east end, still another tunnel connects with the new gymnasium that is now under construction.

In regard to the design of the concrete work, the whole superstructure is carried on piers which are placed five in a row, as shown in the typical section. These lines of columns are spaced 15ft. or 16ft. apart for the straight portions, and at distances occupying 4 deg.—30ft. for the curved ends. A large part of the banks has been formed by a filling of loose earth. In such cases the piers have been carried down to the original soil; where no fill existed, they have been brought down 4ft. 6ins. below the surface. The ground consists in different places of hard pan, gravel, sand or loam. The footings, which are of concrete without reinforcement, are proportioned for a load on the soil varying from 1 to 4 tons per sq. ft.

It was assumed that 600lbs. per sq. in. would constitute a safe load for columns reinforced with vertical rods and hooping, and 400lbs. per sq. in. for columns reinforced, but not hooped. These assumptions were, however, without importance, as other conditions governed the size of the columns. In general they were made of uniform size, of rectangular shape, 12ins. by 30ins., reinforced with four Kahn bars, weighing 27lbs. per foot. The rectangular shape was adopted in order to resist the effect of any sliding tendency that the bank might have. Where it was necessary to use columns of great length, they were made square, with a side not less than 1-15th of the length of the column. These columns were reinforced with four round rods of 7-8ths in. diameter and wrapped with Clinton wire cloth, 3ins. by 8ins. mesh, 8-10ths wire. In general all parts of the structure were figured for a live load of 100lbs. per sq. ft., except the promenade, which was designed for 120lbs., and the roofs over the grand stand and main entrance, which were figured for a live load of 40lbs. per sq. ft.

In calculating bending stresses, the straight line formula was used throughout, and the tensile strength of the concrete was neglected.

The safe compressive stress for concrete was assumed to be 600lbs. per sq. in., and the safe tensile stress for steel 16,000lbs. per sq. in. The girders, steps, and the slab of the promenade were figured continuous, and the maximum bending moment was assumed to be $\frac{W\,L}{12}$, where "W" represents the total dead and live load and "L" the distance between

supports. The negative bending moment over the supports was assumed to be $\frac{W L}{18}$ and steel was provided according to this assumption. The general arrangement for a typical section is shown by drawing. The main girders are 2ft. deep and 1ft. wide. The slab formed by the steps has a minimum thickness of 4ins., and the slab of the promenade a thickness varying from 7ins. to 9ins., depending upon length of span. This design for the promenade was adopted in order to make it possible to remove the forms, which would have been impossible if ribbed construction had been employed.

The main reinforcement for girders, steps and promenade consists of Kahn bars, with steps varying in length from 6ins. to 30ins. In addition to the Kahn steel, Clinton wire cloth has been placed $1\frac{1}{2}$ins. below the surface of all concrete exposed to view. This was done solely in order to prevent cracking, and the Clinton wire cloth was not taken into consideration when figuring the bearing capacity of the concrete. The sizes used were 4ins. by 6ins. mesh, 10-10ths wire, 30ins. wide, for the steps and 3ins. by 8ins. mesh, 8-10ths wire, 72ins. wide, for other places.

One of the most serious problems in concrete construction is to prevent cracking caused by contraction of concrete through temperature changes or through the setting of the concrete. For this purpose it is the practice of a great number of designers to leave in all structures of great length contraction joints, in order to confine the opening up of the concrete to straight lines, and to places where least objectionable. It is the writer's experience that in order to be effective these contraction joints should not be placed farther apart than 25ft. or 30ft. At Syracuse stadium joints spaced at such a short distance would have seriously interfered with the construction and would besides have been quite as objectionable in appearance as promiscuous cracking. It was therefore decided not to leave any contraction joints, but an endeavour has been made to prevent cracking by using a sufficient amount of reinforcing steel.

In order to decide the quantity of steel required, let us assume that the area in cross section of the concrete is A square inches, the area of the steel A' the coefficient of expansion for concrete and steel 0.0000055 and 0.0000065 respectively, the modulis of the elasticity of the steel 30,000,000lbs. per sq. in., and the elastic limit of the steel is 50,000lbs. per sq. in. A temperature fall of 100 deg. would cause a proportionate contraction of the concrete of 0.00055, which is far more than plain concrete could be stretched. If reinforced, it could easily be stretched this amount, and the stress caused would then equal the breaking stress of concrete. If the tensile strength of concrete is 300lbs. per sq. in., and if we assume that the whole stress in the concrete is transmitted to the steel, we have the stress caused in the steel $300 \frac{A}{A'}$ Through the fall of temperature in the steel itself a tensile stress of 10.0 by 0.0000065 by 30,000,000 = 19,500lbs. per sq. in. is caused. We have therefore the following equation :

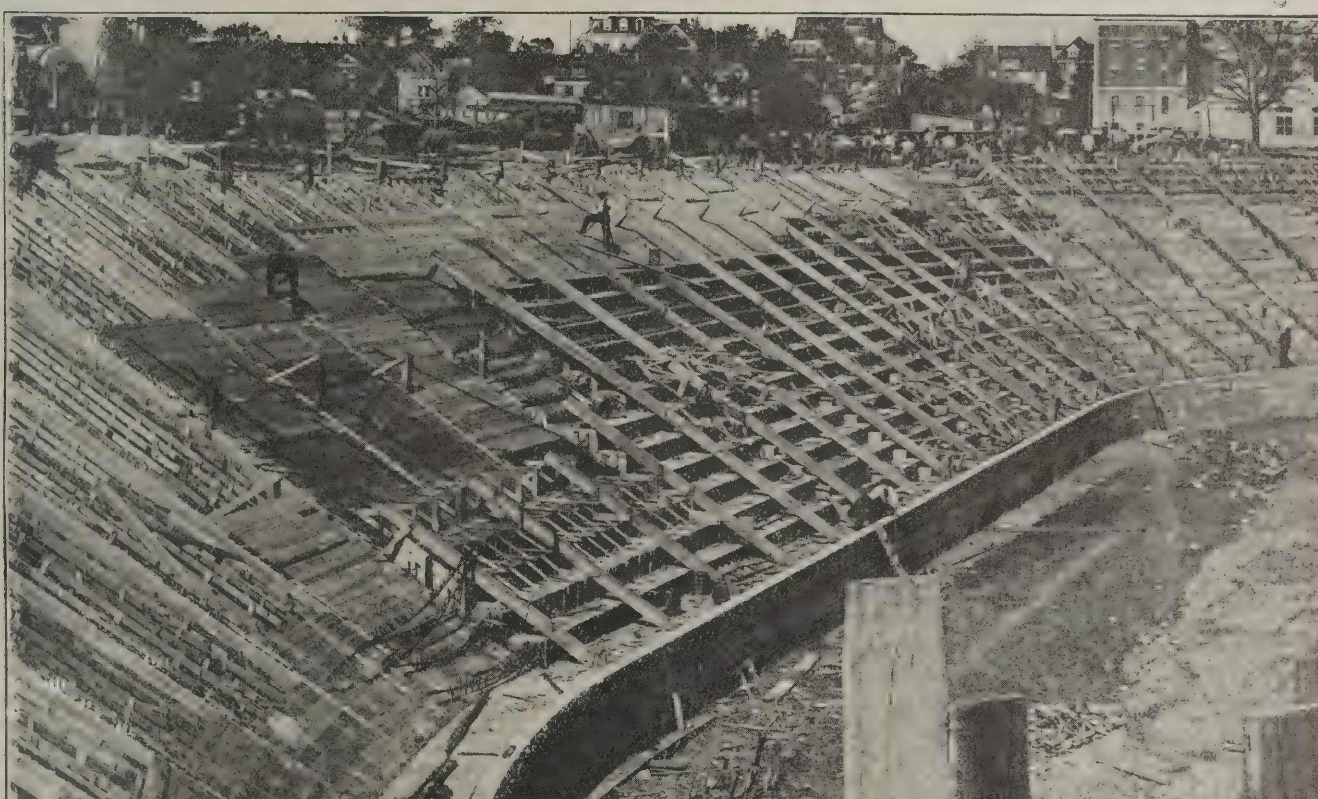
$$300 \frac{A}{A'} + 19500 = 50000$$

The equation gives the proportion of steel to concrete as 1 per cent.

Experiments by M. Considère and others seem to prove conclusively that reinforced concrete retains its full tensile strength even for very considerable deformation. It would therefore be reasonable to assume that only a part of the stresses caused by the cooling of the concrete are transferred to the steel. Allowing that 2-3rds of the stresses are taken by the concrete itself, the proportion of steel required would be 1-3rd per cent. In the design of the Syracuse stadium an effort has been made to keep the percentage of steel above this figure. To insure continuity of the reinforcement, all Kahn bars in the seats and promenade were ordered 2ft. longer than the span. A further precaution against cracking is the Clinton wire cloth that is running around the whole structure below all exposed surfaces.

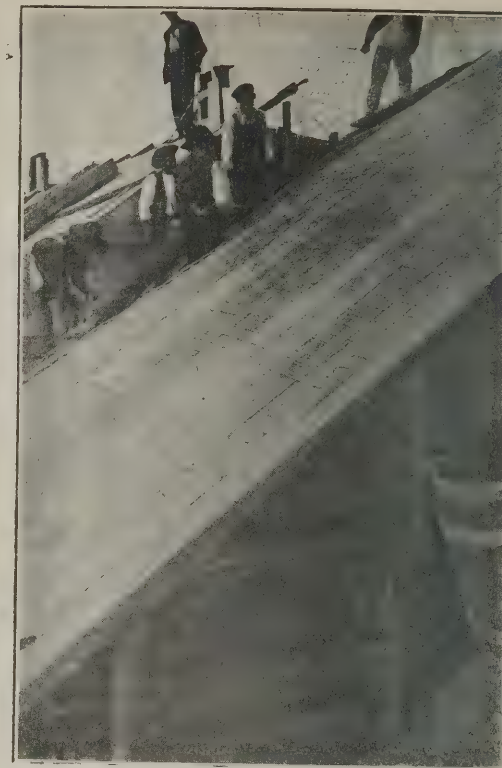
From the equation above, it will be seen that a considerably smaller amount of steel with high elastic limit is required than with low elastic limit. On account of the nature of the surface treatment, it was impracticable to use wire cloth near the surface at the walls on the west side of the structure. Instead, $\frac{3}{4}$in. diameter round steel rods spaced vertically 2ft. apart, and horizontally 18ins. apart, were placed in the centre of the walls. The horizontal bars were ordered in lengths of 40ft. each, were made to overlap, and were wired together at the ends.

As previously mentioned, the centre part of the south side of the stadium is covered and forms the grand stand. The roof itself is a cement roof, reinforced with ferrolithic plates. These consist of steel sheets, gauge 24, corrugated to a depth of $\frac{3}{4}$in., so as to form dovetail grooves. At right angles to these dovetail corrugations, the steel sheets have some lighter corrugations about 1-8th in. deep. These ferrolithic sheets are covered with cement mortar to a depth of $1\frac{1}{4}$ins. above the metal and $\frac{3}{8}$in. below the corrugations on the under side. The sheets are strong enough to support the concrete before set, and no form work is therefore necessary. Through the dovetail shape a good bond is obtained for the cement plaster, so that the plastering on the underside can be done directly on the sheets. The ferrolithic sheets are attached with clips to the purlins, which consist of 6in. I-beams, spaced about 6ft. 10ins. apart. The roof



STADIUM FOR SYRACUSE UNIVERSITY, IN COURSE OF CONSTRUCTION

Centering for Tunnel to Gymnasium.



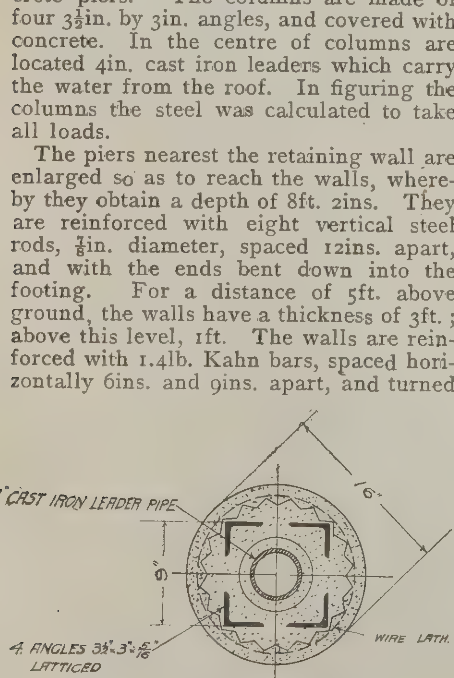
Roof of Tunnel to Gymnasium in Course of Construction

THE NEW STADIUM AT SYRACUSE, U.S.A.

construction is formed by steel trusses of the type known as "French" trusses. At the right and bottom, the main trusses are joined by lattice and plate girders, which carry intermediate trusses. From the top of the two end trusses project cantilever girders which serve to carry the four trussed hips.

For the circular and Gothic arches immediately below the roof, a framework of light steel angles has been used. This steel work has been furred with small steel channels and bars, covered with metal lath and plastered with cement. The roof structure is supported by steel columns in the front and sides, but in the rear, the trusses come down directly upon the concrete piers. The columns are made of four 3½in. by 3in. angles, and covered with concrete. In the centre of columns are located 4in. cast iron leaders which carry the water from the roof. In figuring the columns the steel was calculated to take all loads.

The piers nearest the retaining wall are enlarged so as to reach the walls, whereby they obtain a depth of 8ft. 2ins. They are reinforced with eight vertical steel rods, ⅞in. diameter, spaced 12ins. apart, and with the ends bent down into the footing. For a distance of 5ft. above ground, the walls have a thickness of 3ft.; above this level, 1ft. The walls are reinforced with 1.4lb. Kahn bars, spaced horizontally 6ins. and 9ins. apart, and turned



SECTION THROUGH COLUMNS OF GRAND STAND.

into the piers 4ft. at each end. The earth behind the walls consisted of gravelly clay, and in figuring the retaining walls it was assumed that the weight of the earth was 110lbs. per cub. ft., and that the angle of repose was 30 deg.

The two tunnels for the straightaway at the east and west ends of the building go through the retaining walls at an angle of 37 deg., and form openings in same about 34ft. wide. Three feet from the outside ends of the tunnels a pocket is left in the roof and walls of same in which is placed a rolling steel shutter, furnished by the Kinnear Manufacturing Company, of Columbus, Ohio. The tunnel leading to the new gymnasium is located in the east end at the longitudinal axis of the stadium. It has a width of 20ft., and a height in the centre of 14ft. Immediately below the promenade, the floor of the tunnel is horizontal, and 16ft. 4ins. above the field, but in the front part the floor is formed by concrete stairs leading up to this level. The horizontal part of the floor, as well as the stairs, is supported by the tunnel walls, thus having a span of 20ft. The floor is 8ins. thick and reinforced with 1.4 Kahn bars 6ins. centre to centre. The slab of the stair is 6ins. thick, and the reinforcement consists of 1.4 Kahn bars, one for each step. The centre part of the stair is protected by Mason's Safety Treads, 7½ins. wide and 13ft. long. At the ends, the steps are covered with 1⅝in. treads of North Carolina pine nailed to wooden sleepers embedded in the concrete.

The walls of the tunnel are 15ins. thick, reinforced with 1.4lb. Kahn bars placed vertically near the inside of the walls at a distance of 9ins. centre to centre. They are also reinforced with Clinton wire cloth 3ins. by 8ins. mesh, 8-10ths wire. It will be noticed that the roof of the tunnel in a concrete arch, with the underside forming part of a circle and the outside formed by the regular seats and promenade of the structure. The thickness at the crown of the arch varies from 12ins. to 14ins. A layer of Clinton wire cloth runs near the under side of the arch, as well as near the surface of the steps.

Features of the gymnasium now in course of construction are two large tanks of reinforced concrete for swimming and rowing. Both of these tanks are located in the basement, and are completed as far as the concrete work is concerned. As will be seen from the drawing, the swimming tank is 32ft. wide and 90ft. long, measured to the finished surfaces. At the corners the tank is rounded to a radius of 2ft., in order to give less obstruction to the flow of the water. The tank will be finished in white tile, waterproofed with asphalt felt placed between the concrete and the tile. At the deepest point, 10ft. from one end, the tank has a depth of 7ft. 6ins., diminishing to 4ft. 6ins. at each end. The tank rests directly on the ground, which here consists of loose clay. The bottom has a minimum thickness of 12ins., and is stepped on the underside, so as to obtain the desired slope. It is reinforced with Clinton wire cloth near the upper and undersides. The sides of the tank have a thickness varying from 12ins. to 22ins. They have on the inside one layer of Clinton wire cloth, as well as 1.4lb. Kahn bars, spaced 18ins. apart. The Clinton wire cloth used in the bottom and sides of the tank has a mesh of 3ins. by 8ins. and 8-10ths wire.

The design of the sides of the swimming tank has been influenced largely by the fact that they serve as a foundation to the outside walls of the building, as well as for interior and exterior steel columns. The rowing tank is similar in design to the swimming tank, but has a length of 60ft. and a width of 32ft. The bottom slopes evenly from a depth of 4ft. 6ins. at one end to 6ft. 6ins. at the other one.

In regard to the execution of the work for the stadium, this was started by Syracuse University without the aid of any contractor, and a considerable amount of excavation was done on this basis under the direction of Professor Paul Nugent.

Later, the construction of the stadium was awarded to a firm of general contractors.

The lumber used for the forms of the concrete work was principally hemlock, but also some North Carolina pine and a small quantity of spruce. It consisted largely of the following dimensions: 1in. by 6ins., 1in. by 8ins., 2ins. by 4ins., 2ins. by 8ins., and 2ins. by 10ins. Of these sizes the 1in. by 6ins. and the 1in. by 8ins. were planed, and on one side tongued and grooved; other sizes were rough. All forms for square or rectangular columns were made of 1in. boards with bracing 18ins. or 24ins. apart. The bracing consisted in most cases of four pieces of 2ins. by 4ins., put together with wedges.

For round columns the forms were made of 2ins. by 2ins., or 2ins. by 3ins. pieces of North Carolina pine, dovetailed and held together with iron bands or wood braces.

As regards the forms for girders supporting the seats, the sides and bottom were made of 1in. board, braced by a frame of 2 ins. by 4 ins. every 2 ft. To keep the concrete in place, it was necessary to cover the upper side of the girders, which were sloping. In order not to interfere with the tamping of the concrete, this was done in the following manner: — For every batch of concrete filled into the girder, a few short pieces of 1in. by 6in. boards were nailed to the upper side of the girder. These pieces were not put close together, but at a distance of ½in. Large spikes were placed in these spaces in order to give good bond between the girders and the slab on top of them. To support the slab of the promenade and the seats, forms were made of 1in. boards, with 2in. by 4in. pieces, 30ins. apart. They were built in sections 3ft. or 4ft. in width, and in length occupying the space between two girders. These sections were blocked up to the correct level directly from the ground.

At each end and at the centre, a rope was attached to the forms, with which they were pulled out from under the concrete after it had set. It was necessary in a few cases, however, to leave the forms in place.

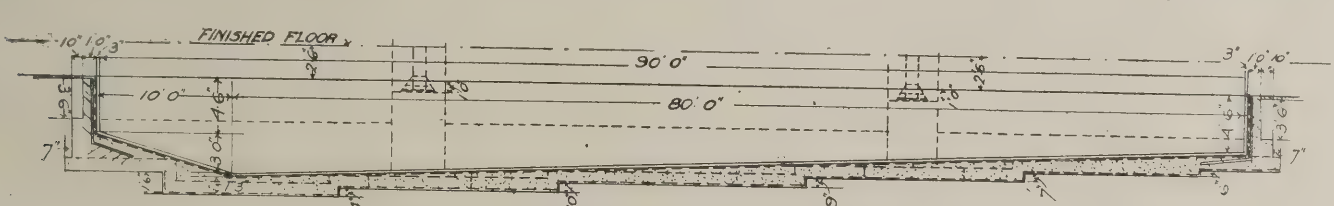
The form work for the seats was made by placing 2ins. by 10ins. stringers, 10ft. apart, in the same direction as the girders, and at such height that the forms for the risers could run below and brace against them. These forms for the risers were made of 2ins. by 8ins. and 2ins. by 10ins. plank. The forms for the walls were made of 1in. boards, in sections 3ft. and 4ft. in width, and 12ft. or 16ft. in length. To keep them at the proper distance steel wires running between the braces and distance pieces of wood were used.

The concrete work of the stadium is composed of cement, sand and pebbles, in proportions 1, 3 and 5, for the plain concrete, and in proportions 1, 2 and 4, for the reinforced concrete. Throughout the work, Empire Portland cement was employed.

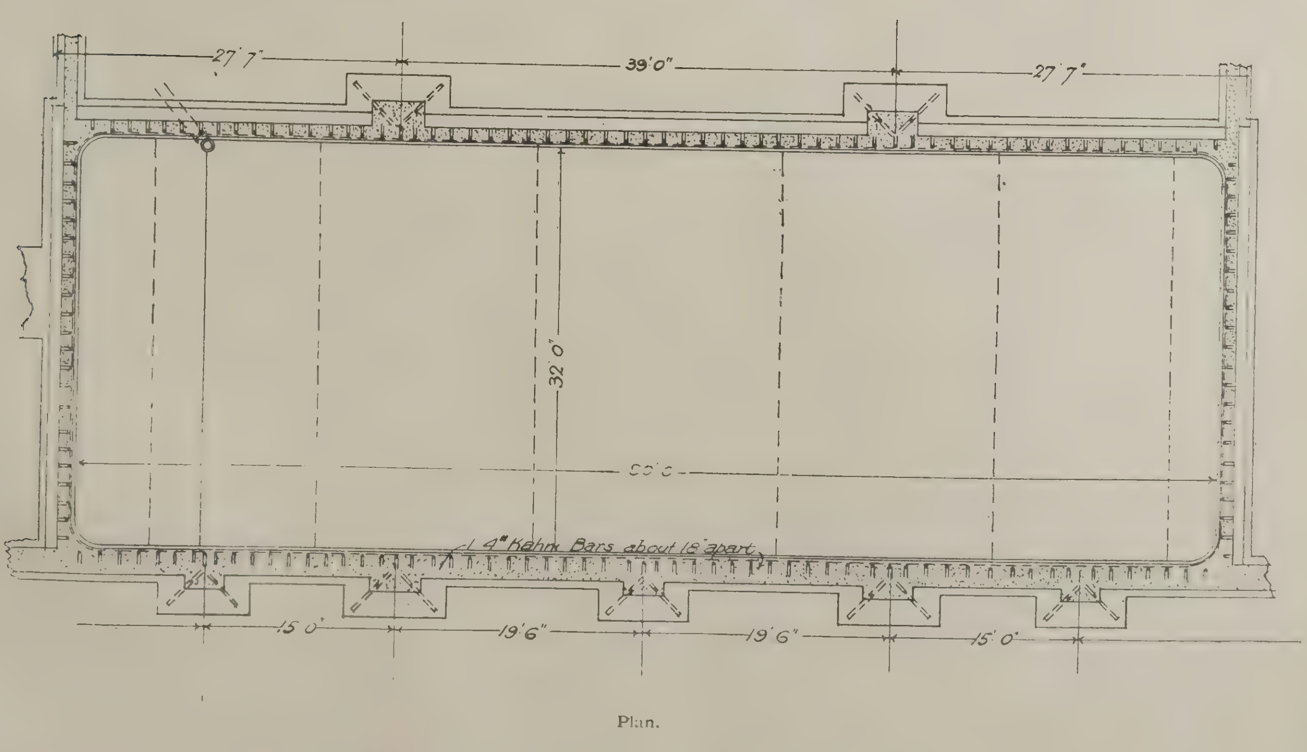
The stone consisted mostly of limestone and trap rock. For plain concrete work it was broken to pass through a 2in. ring, and for reinforced concrete work to pass through a ¾in. ring. The stone was not screened. All concrete was mixed very wet, and very thorough stirring was necessary to get the forms properly filled, particularly where Clinton wire cloth was used as reinforcement.

All concrete was mixed by machinery. The plant for mixing the concrete consisted of five Ransome mixers with engine and boilers, and a small Smith mixer on wheels, used as an auxiliary. From the mixers the concrete was carried in dump cars, running on an industrial track around the promenade. From the cars the concrete was dumped on wooden platforms and thrown with shovels into the forms or into chutes carrying it down to another platform. In some cases the concrete was put down into the forms directly with wooden chutes, but generally it was placed in the forms with shovels.

Probably the least satisfactory feature about concrete work is the difficulty of obtaining a pleasing appearance. In considering the method to be employed at the stadium, it was thought that the finish obtained by tooling the concrete with pick hammers would not be suitable for the nature of the work, and that plastering the forms with cement and sand mortar before pouring the concrete into them would be impracticable on account of the large amount of reinforcing steel located near the surface. It was therefore decided to finish the concrete work by plastering the same after the removal of the forms, as the only way in which the construction work could be carried on without being held up by the finishing work. To obtain a good bond between the plaster and the old concrete some special means have been employed. At frequent intervals holes were drilled in the forms, and wire nails inserted so as to project about 2ins. outside the concrete after the removal of the forms. Before applying the plaster a small iron nut was put on each projecting nail; the concrete work was then covered with wire lath, and the nails bent

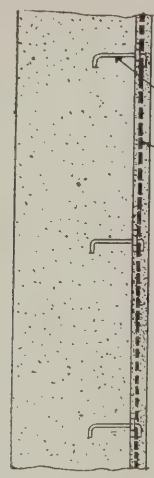


Longitudinal Section.



Plan.

SWIMMING TANK FOR GYMNASIUM, SYRACUSE UNIVERSITY, U.S.A.



DETAIL SHOWING METHOD OF FINISHING CONCRETE AT THE STADIUM, SYRACUSE, U.S.A.

over it with the blow of a hammer. The nuts serve to keep the wire lath at a distance of about ¼in. from the old concrete. The wire lath used was 2½ins. by 2½ins. mesh, and 20 wire. The nails were about 4ins. long, with a bend of ¾ins. at one end, and a diameter of ⅛in. The nuts were either square or hexagonal, about ½in. high. The plaster was put on in two coats, with a total thickness varying from ¾in. to 2ins. The scratch coat was composed of one (1) part cement, ¾ part lime, and three (3) parts sand. The finishing coat, which is about 3-16ths in. thick, is composed of one (1) part cement to 1¾ parts of sand. The sand used in the finish is white beach sand, from Long Island. To carry the plaster to the desired lines iron templates were placed at intervals, and the plastering finished to them. After the finishing coat had commenced hardening the templates were removed, and the void left by them filled in. The second coat of plaster was put on when the scratch coat commenced hardening, and was troweled to a smooth finish. While the plastering was being executed the work was protected from the sun by wooden sheds, which were erected over it and moved according to the progress of the work. During the hardening of the plaster it was covered with canvas, and on top of same a layer of sand, which was continually kept wet. Later, several weeks after the application of the plaster, the structure was washed with hydrochloric acid, whereby the neat cement was removed from the surface. In this way the texture was materially improved, and a more even colour was obtained. To take away all traces of the acid, the concrete work was then washed with water with some lime in it, and afterwards thoroughly cleansed with water.

The method as above described for finishing the surface was followed for all exposed concrete work at the stadium except in places where the concrete was composed of cement, sand and pebbles. No plastering was done in these places, but the concrete walls were washed with hydrochloric acid and worked with wire brushes, so as to remove the cement and leave the pebbles sticking out. This method offers the great advantage that the treatment with the acid and wire brushes can be made at any time after the concrete has set. Good results were obtained at times varying from twenty-four hours to three months after the concrete was put in place. The pebbles were mostly white in colour and ¾in. diameter.

The amount of structural steel in the grand stand was one hundred and forty-five (145) tons, and a time of three weeks was required for the erection of same. The steel was furnished by Archbold-Brady Company, of Syracuse, but erected by the general contractors for the stadium.

The quantities involved in the construction of the stadium are approximately as follows:—Excavations, 250,000 cub. yds; concrete work, 18,000 cub. yds.; reinforcing steel, 500 tons; Clinton wire cloth, 280,000 sq. ft; metal lath, 220,000 sq. ft.; lumber, one million feet broad measure. The seating capacity is estimated to be 18,000, but using the promenade as standing room, the structure could easily accommodate 40,000 people.

The general contract was awarded in September, 1906, to the Consolidated Engineering and Construction Company, of New York. The work was commenced at once, and was practically completed in October, 1907. The architects were Messrs. Revels and Hallenbeck, professors at Syracuse University. The engineering drawings were executed by the writer, who also acted as chief engineer for the contractors.

THE CORROSION OF STEEL.*

By Allerton S. Cushman, Assistant Director, Office of Public Roads, United States Department of Agriculture.

Iron is unique among the elements, not only on account of the ease with which it dissolves or combines with nearly all other elements, but also on account of the changes in structure and physical character which are produced by the presence of almost infinitesimal quantities of impurities. A variation of a few tenths of one per cent. in the amount and condition of the carbon content may produce such a change in the physical properties of the metal, as to entirely alter its fitness for the various purposes to which it is put. A variation of a few hundredths of one per cent. of phosphorous in the specifications for certain useful forms of steel has been and still is a matter of controversy between interests representing hundreds of millions of dollars of capital and involving the questions of the safeguarding of the lives and property of the public. Sulphur, silicon, and manganese are among the other well-known elements whose presence, absence, or condition in extremely small amounts produce important difference in the character of steel. Absolutely pure iron has but a limited use in the industries of man, and as a rule the properties which are sought are produced by the presence of other elements.

This point is emphasized in order to call attention to the fact that, chemically speaking, structural iron or steel is not a standard substance, but varies in composition and in character.

I have frequently called attention to the fact that resistance to corrosion was one of the most variable of the many characteristics of steel. That is to say, not only do the various kinds of merchantable iron and steel differ from each other within wide limits in their resistance to corrosive influences, but specimens from the same mill or furnace will frequently show a great difference in this respect. There are few subjects at the present time more important to the engineer and the architect than the protection of structural steel from rapid unsightly and dangerous corrosion. I wish to point out that there are two separate and distinct lines along which we may hope to make progress.

*A paper read before the 41st Annual Convention of the American Institute of Architects, at Chicago.

The first of these has to do with the understanding of the causes which promote corrosion and their elimination in the manufacture of the metal, and the second is the study of paint-films or waterproof coatings which shall really protect even the most inferior metals for indefinite periods. It is only the first phase of the subject that I shall consider.

The tendency to oxidation is a characteristic inherent in iron and an absolutely unrustable iron or steel will probably be impossible of accomplishment, even in the distant future. If, however, all the steel made resisted corrosion as well as the best of it, there would be no problem, and this paper would not have been written.

I shall not take your time this evening to review the older theories which were held to account for the rusting of iron, but will call your attention to the electrochemical or electrolytic explanation, which is now coming to be generally accepted. According to modern chemical theory, all reactions which take place in water solution are attended by certain readjustments of the electrical states of reacting particles which are called ions. You are undoubtedly aware that under the atomic theory molecules of compound substances are made up of atoms which are held together by a force or forces which represent large amounts of energy. Now, some substances, when they are dissolved in water, will conduct electricity, while others will not. The first class of substances which are generally inorganic acids, alkalies, and salts, we call electrolytes, while those organic bodies, such as sugar, which do not conduct electricity in solution, are non-electrolytes.

Arrhenius, a Swedish physicist, in 1887, announced the theory of electrolytic dissociation, the evidence for which cannot be discussed here, but it can be said that the theory has been borne out by numerous researches, and is at the present time almost universally accepted. This theory tells us that the molecules of electrolytes, as they pass into solution in water, dissociate into ions which are simply atoms carrying, in spite of the smallness of their mass, very heavy charges of electricity. In order that no energy may be lost or gained, it follows that the dissociation must produce both positive and negative ions, which are equivalent and opposite. A rough analogy of what has taken place through dissociation is furnished by a coiled steel spring. If we put such a spring in tension and hold it thus, without addition or substraction of material, we have impressed potential energy upon it, which will be returned in equivalent amount when by any means the tension is relieved. Indeed, we might consider one end of the spring as positive to the other end, and that in relieving the tension the energy reappeared by the neutralization of the positive and negative potentials.

To illustrate further what is meant by the theory of solutions, let us consider the system, common salt and pure water. Common salt is composed of an atom of sodium combined with an atom of chlorine, and the molecule is represented by the simple chemical formula Na Cl. When sodium chloride is brought together with water, it tends to go into solution, the molecules mingling with the molecules of the water owing to a force known as solution pressure. As an increasing number of molecules appear in solution, however, a back pressure is exerted which, to a constantly increasing extent, resists the entrance of

more molecules. This reverse action is known as osmotic pressure, and it is perfectly clear that if an excess of salt is present, the end of the action will come about for any definite temperature just as soon as the osmotic pressure and the solution pressure are equal. But in addition to this the very important action takes place which has been just referred to. In passing into solution the salt dissociates into its constituent ions, which simply means that the solution forces tear apart the associated atoms and the energy which held them together appears in a potential form as equal and opposite charges of static electricity on the ions. So that the solution of salt in water is represented by the equation:

$$\mathrm{Na\,Cl} \longrightarrow \overset{+}{\mathrm{Na}} + \overset{-}{\mathrm{Cl}},$$

in which $\overset{+}{\mathrm{Na}}$ and $\overset{-}{\mathrm{Cl}}$ represent the constituent ions. Osmotic pressure, however, acts against the dissociation pressure, so that in concentrated solutions we have a reverse action also taking place represented by the equation:

$$\overset{+}{\mathrm{Na}} + \overset{-}{\mathrm{Cl}} \longrightarrow \mathrm{NaCl}$$

Chemists therefore say that the state of equilibrium for the system we are considering can be expressed by the reversible reaction:

$$\mathrm{NaCl} \Longleftrightarrow \overset{+}{\mathrm{Na}} + \overset{-}{\mathrm{Cl}}.$$

Now, bearing these simple details of the modern theory of solution in mind we may return to the consideration of the reactions which take place when iron rusts. If a bright strip of iron is immersed in a solution of a copper salt, such as the sulphate, iron goes into solution and copper plates out on the iron. The reason for this is that the solution pressure of the iron is greater than that of the copper ions, therefore iron passes into solution, the positive static charge being transferred from the copper ions to the iron ions. This reaction is simply written:

$$\mathrm{Fe} + \overset{+}{\mathrm{Cu}} \,.\, \overset{-}{\mathrm{SO_4}} = \overset{+}{\mathrm{Fe}} \,.\, \overset{-}{\mathrm{SO_4}} + \mathrm{Cu}.$$

Now, if we leave out the copper sulphate in this system, and immerse the strip of iron in plain water, a similar reaction takes place. It is known to chemists that even the purest water is to a slight extent dissociated, and therefore contains hydrogen ions. That is to say, while water consists mainly of molecules written H_2O, there also are present positive hydrogen ions $\overset{+}{\mathrm{H}}$ and the equivalent negative hydroxyl ions $\overline{\mathrm{OH}}$. Hydrogen acts as a metal and has a solution pressure somewhat less than that of iron. Therefore, when iron is by any means whatever brought into contact with water it will, to a certain extent, pass into solution by exchange with hydrogen. This reaction, upon which all forms of corrosion are primarily based, may be written:

$$\mathrm{Fe} + 2\overset{+}{\mathrm{H}} \,.\, 2\overset{-}{\mathrm{OH}} = \overset{+}{\mathrm{Fe}} \,.\, \overset{-}{\mathrm{OH}} \,.\, \overset{-}{\mathrm{OH}} + 2\mathrm{H}.$$

It has been shown experimentally that iron cannot, at ordinary temperature, combine with oxygen unless the iron first passes into solution and it is apparent from this that the initial cause of rusting is not oxygen, but hydrogen bearing a static electrical charge, in other words, the hydrogen ion. Now all acids derive their character from the fact that they dissociate in solution with the production of hydrogen ions, and this is the reason why all acids stimulate the corrosion of iron. On the other hand, alkalies dissociate in solution with the production of hydroxyl ions, which, by the reverse action already explained neutralize and remove the hydrogen ions and thus inhibit rusting.

It is well known to architects that sulphurous acid, as well as carbonic acid, from coal smoke produces rapid destruction of steel, whereas alkaline cements, mortars, and concrete will preserve steel embodied in them as long as the reaction remains sufficiently alkaline. The only cases recorded in which steel is said to have corroded when embedded in concrete, are those where percolating water under pressure has washed away the free lime and thus removed the alkaline reaction.

We may now turn to the role played by oxygen in the rusting of iron. Iron is one of those elements which exist in more than one state of combination with oxygen. The least oxidized state is called *ferrous*, while the higher state is known as *ferric*. Excess of oxygen always changes the ferrous to the ferric state. Iron, having once appeared in solution in the ferrous condition by exchange with hydrogen, is at once attacked by oxygen and precipitated at the point of attack in the form of the red insoluble hydrated oxide which is known as rust. This statement is easily proved by experiment, for all solutions of ferrous salts are directly oxidized or rusted by standing in the air. The role of oxygen is therefore secondary, but it is none the less important for the simple reason that by precipitating the insoluble rust the iron ions are destroyed and removed from solution, thus lowering the osmotic pressure and making room for more to be formed. The scientific explanation would be that the appearance and precipitation of the solid phase (rust) lowers the osmotic pressure, thus enabling the iron, driven by its solution pressure, to pass rapidly into the ionized condition.

To sum up, then, as far as we have gone, the rusting of iron is caused, first, by the solution of the metal by exchange with hydrogen, and secondly, by the action of oxygen on the dissolved portion, both actions being accomplished by a transfer and neutralisation of electric charges on the reacting atoms or ions.

The next important point is that the solution of the iron does not, as rusting proceeds, take place uniformly over the exposed surface, but, on the contrary, the solution is stimulated at certain nodes or points and inhibited at others. To this direct local electrolysis is due the peculiar form of corrosion known as pitting which is almost always observed when iron and steel are deeply rusted.

The fact that iron does not tend to go into solution uniformly and evenly all over the exposed surfaces, but passes rapidly into solution at certain surface points, can only be interpreted in one way, namely, that local electrolysis is taking place.

Now, applying what has already been said, it follows that as each iron ion appears in the solution a hydrogen ion must leave the system in order to maintain the equilibrium and so that no energy be lost or gained. It follows from this that hydroxyl ions must be left behind as the hydrogen changes to gaseous form and disappears, so that we should expect to find a congregation of iron ions at one pole in the electric circuit and hydrozyl ions at the other. Owing to the formation, then, of these local electric couples, the surface should be protected at the negative poles around which the alkaline hydroxyl ions cluster, and attacked at the positive, where the iron is passing into solution, and being acted upon by oxygen.

Now, this action can be easily made visible as it takes place by means of a special indicator to which the writer has given the name ferroxyl. There is a certain re-agent called potassium ferricyanide that forms a beautiful blue colour, known as Turnbull's blue, when it comes into contact with ferrous irons. There is also an organic substance known as phenolthalein, which makes a beautiful rose-pink with hydroxyl ions. Specimens of steel immersed in a solution of these mixed substances, and stiffened with Agar Agar so that they can not shake about, invariably show blue and red nodes, showing beyond all doubt the development of positive and negative nodes as corrosion proceeds.

Time will not allow of the presentation of a full discussion of the proofs that have been given to show that the corrosion of iron is always due to local electrolysis on the surface of the metal itself. The subject has been presented in detail in a bulletin recently issued by the U.S. Department of Agriculture. One of these demonstrations will, however, probably be of interest here.

If a section of rolled metal, such as sheet or plate, is immersed in water, if the electrolytic theory is correct, rusting must take place with the establishment of positive and negative spots or areas. At the positive points iron will pass into solution and be rapidly oxidised to a loose, gummy, or so-called colloidal form of ferric hydroxide which is characteristic of rust formed under these conditions. It is a well known fact, as has been proved by experiment, that colloidal ferric hydroxide will move or migrate to the negative pole if subjected to electrolysis. We may, therefore, consider the possibility of two separate effects that may be produced, viz., (A) when a positive centre is surrounded by a negative area, and (B) *vice versa*.

Now, as rusting proceeds, we should expect in the caes of (A) that the ferric hydroxide would be piled up in a crater formation, while the metal is eaten out at the centre. In the case of (B) the effect would be reversed, and while the metal would be attacked in the surrounding area the hydroxide would be piled up in a cone at the centre. That this is precisely what is taking place whenever a sheet of metal rusts under water a low-power microscope very clearly shows.

The photomicrographs in which the craters and cones are clearly shown have been published in the bulletin referred to above.

If you are willing to accept the electrolytic theory of corrosion you will very naturally inquire in what respect does it point the way to an improvement in the conditions as they exist at the present time. It follows from what has been said, that the more carefully lack of homogeneity and bad segregation are guarded against during the processes of manufacture the less likely is the metal to suffer from rapid corrosion. If the iron contains metallic impurities dissolved in it, such as manganese, which differ electrochemically from iron, trouble is sure to ensue if there is a lack of homogeneity in the distribution of the impurity. In the old days when iron was made more slowly and received more careful working than is possible in the present day, serious corrosion of iron was not the important problem it has since become.

The writer has in his possession a hand-forged nail that is still in good condition, which was driven in the old Masonic Hall at Richmond, Virginia, in 1807, and for a long portion of this time it has been freely exposed to the weather. There is a wide-

spread opinion, which the writer shares, that the old wrought or puddled iron of thirty years ago is more resistant to corrosion than most of the modern steels.

But the interesting point is that modern steels vary so widely from each other. Here are two pieces of angle steel which constituted two members of a signal bridge erected on the Boston and Maine railroad in 1894. These members were only six feet apart in the structure, and the conditions of environment, exposure and care were precisely similar, and yet one is corroded to the condition of lace work, while the other is hardly touched. The chemical and microscopical examinations of polished samples cut from these two specimens does not show any essential differences, both contain about 0.5 per cent. of manganese, and yet electrolysis has proceeded rapidly in one and almost not at all in the other. Does it not seem probable that the ingot, or portion of ingot, from which one of these members was rolled differed in segregation, or in chemical homogeneity, from the other? At all events, if all the members in this bridge structure had been as good as this best one, they would still be in service instead of on the table before you. It is of the utmost importance that we should learn to control the resistance to corrosion of structural steel, and to this end we should unite to urge upon manufacturers the necessity of making special efforts in this direction.

It would follow from the electrolytic theory that in order to have the highest resistance to corrosion a metal should either be as free as possible from certain impurities or should be by careful working and heat treatment rendered so homogeneous as not to retain localised positive and negative nodes for a long time without change.

Manganese is an element which is almost always associated in modern metallurgy with iron and steel, owing to the fact that this element is used as a flux in the great processes used to-day for changing cast iron into steel. Manganese, however, increases the electrical resistance of iron and as the percentage of this element, starting from zero, rises, the electrical conductivity of the metal decreases up to a certain specific maximum. Now, you will see, if the dissolving of manganese in iron raises the electrical resistance, that any changes in the equilibrium or distribution of the manganese in the metal means that there will not be an even or homogeneous electrical conductivity throughout the mass.

If we have a metal in which the electrical conductivity for any reason varies from point to point on the surface we have the precise conditions which are necessary in order to establish the local nodes of electrolytic action on the surface which lead to rapid corrosion. It is apparent, therefore, that if we are to allow the presence in structural steel of comparatively high percentages of metallic impurities, such as manganese, we must attempt to obtain an extremely homogeneous distribution of such impurities. It is for this reason principally, in the opinion of the writer, that the more quickly and more carelessly the metal is manufactured and rolled, the more quickly it disintegrates under corrosive influences. As has been pointed out before, there are two methods of meeting the problem: First, to keep the percentage of metallic impurities as low as possible; and, secondly, to guard against segregation and imperfect chemical homogeneity in the metal. In experiments we have made looking to the manufacture of a corrugated steel culvert for use in road building, it has been found by the author that corrugated metal, running as low as .04 manganese, has been more resistant to the corrosive test employed than the ordinary steel of the day, which usually carries about 5 per cent. manganese. Material of this kind has not been available for a sufficient length of time to determine whether, under service conditions, this low mangansese metal will be longer lived, but it can safely be stated the indications are all in its favour.

The writer has urged the manufacture of manganese-free steel for certain purposes, not because manganese is necessarily the cause of rapid corrosion, but because this impurity enables the metal to be rolled more easily and more cheaply, and in many cases permits the working in of larger amounts of heterogeneous scrap. It is possible to manufacture shoddy steel as well as shoddy cloth, and though both of these materials have their legitimate uses for certain purposes, no one will claim for them high resistance to distintegrating influences. It is a hopeful sign of the times that manufacturers are beginning to pay serious attention to the manufacture of iron and steel for certain purposes which shall be to the highest possible degree rust proof.

Considerable attention has been given to the peculiarly passive condition that can be induced on the surface of iron by contact with solutions of certain oxidizing agents. Without going into the details of this phenomenon, which have been already published, I will refer briefly to the peculiar action of chromic acid and its salts. Polished specimens of steel may be kept indefinitely without suffering corrosion when immersed in a dilute solution of potassium bichromate. On first thought it would seem a paradox that a strong oxidizing agent should have the effect of preventing the oxidation of iron, and yet this is the case.

According to the theory of the writer, the oxidizing agent polarizes the surface of the iron to the condition of an oxygen electrode, so that it is immune from the attack of the hydrogen ions; thus the whole electrolytic process is checked or inhibited. A curious feature of this action is, that it is to a certain degree persistent after the metal has been removed from contact with the oxidizing solution, washed and wiped. This phase of the phenomenon requires further study, but at the present time it does not appear probable that the induced passive condition can be maintained on the surface to an extent that would make it of practical value for treating structural steel. With regard to the preservation of boiler tubes, and for certain special purposes, it is not unlikely that a practical application of these principles will be found.

In conclusion, it may be said that there is reason to hope that the time is not far distant when specifications may be drawn for material that is going into service under conditions which make it particularly subject to corrosive influences. The possible added cost of such specially resistant metal will be small in comparison to the benefits which will be derived from its use in the long run.

THE BIGGEST HOTEL IN THE WORLD—the La Salle Hotel—is to be erected in Chicago. Including furnishings, it will represent an investment of £700,000, while including site the total will run up to £1,200,000. The building will be twenty-two storeys high, and will have 1,172 rooms.

CONCENTRATED LOADS ON JOISTS.

By Alan E. Fletcher, M.S.E.

When selecting joists or girders from a section list it is often desirable to have a simple means of getting the distributed load equivalent to a concentrated load dividing the joists into two unequal spans. When the concentrated load is central it is easy to double it and select a joist strong enough; but usually in the case of lintols supporting another joist or girder or trimmers, the load will more often come out of centre. The following simple rule, which the writer does not remember to have seen mentioned in any of the books on the subject, is a useful one, and enables a suitable girder or joist to be immediately picked out from a table of safe distributed loads.

Let T be the tabular equivalent distributed load in tons;

W the concentrated load to be carried in tons;

a and b the lengths into which the load divides the span in feet:

S the span of joist in feet.

Then—

$$T = \frac{W \times 8 \times a \times b}{S^2}.$$

Conversely to find the strength of given joist for given irregular loading.

$$W = T\,\frac{S^2}{8.\,a.\,b.} \qquad (2).$$

For example—a joist required of 12ft. span to carry another which runs into it 4ft. from one end, bringing a load of 6 tons upon it

Then (1) Equivalent distributed load =

$$(T) = \frac{W.\,8.\,a.\,b.}{S^2}$$

$$= \frac{6.\,8.\,4.\,8.}{144} = 10{\cdot}66.$$

Reference to a list of British Standard Beams shows that an 8 x 6 x 35lb. joist carries 11.5 tons on the span named, and is suitable.

Conversely—the strength of a 12 x 6 x 44lb. of 16ft. span carrying a concentrated load 6ft. from one end would be (2) (With load for 16ft. span = 16 T).

$$W = \frac{16 \times 16^2}{8 \times 6 \times 10} = 8.\,5.\ \text{tons (about)}.$$

The reason for the formula will be easily seen. The moment of a distributed load is equal to $\frac{WS}{8}$ or using the same notation

$$M = \frac{TS}{8} \qquad (3).$$

The moment of a concentrated load is expressed by

$M = \frac{Wab}{S}$ and equating (3) to (4); the formula $T = \frac{W.8.a.b}{S^2}$ is arrived at.

It is well to remark that in the case of joists loaded with concentrated loads close to the ends, webs may be insufficient to carry the shearing stresses, although under a distributed load the strength is as a rule ample. In the case of an 8 x 6 x 35lb. joist carrying another 2ft. away from one end on a 12ft. span—the safe load would be

$$= W = \frac{TS^2}{8.a.b} = \frac{\overset{T}{11\,5} \times 144}{8 \times 10 \times 2} = 10{\cdot}35$$

and the shear stress on the shorter span would be

$$= \frac{W.a}{S} = \frac{10{\cdot}35 \times 10}{12} = \text{say } 8{\cdot}6\ \text{Tons.}]$$

The thickness of web of this section is .44 inches and its depth = 8in.—(2 flange thicknesses—2 1/6th of web), since 1/6 of web next to such flange is considered as resisting the bending moment only.

2 = 8 in.—(2 x 1 x 2 1/6 .8)—4 in., giving an area of 4 x .44 = 1.76 sq. in. Dividing the maximum shear stress by this we get $\frac{8 \cdot 6}{1 \cdot 76} = 4 \cdot 9$ tons per sq. in.—which is rather too high for good work, so that the web would require stiffeners. In practice it would be found cheaper to use a slightly larger section, which with a larger area of web would reduce the shear stress per square inch to proper limits.

THE ERECTION OF STEEL BRIDGES.

At a meeting of the Institution of Civil Engineers held on February 11th Mr. A. L. Dickie, M.I.C.E., read a paper on "The Erection of the Pwll-y-Pant Viaduct on the Brecon and Merthyr Extension of the Barry Railway."

This viaduct is for a double line of railway, is 800 yards in length, and crosses the main line of the Rhymney Railway, the Rhymney Valley, and the river of that name, about 10 miles north of Cardiff. It consists of eleven spans of steel lattice girders, each 170 ft. 11 ins. in length, which rest on brick abutments, and ten intermediate piers, eight of these piers being over 100 ft. in height; and the viaduct terminates at its north and south ends with semicircular brick arches of 36 ft. span.

The chief feature of interest in the work was the special method adopted for the lifting, carrying forward, and subsequent launching of the girders of eight of the spans on to the piers in advance of those already erected. With a viaduct such as that described, ½ mile in length, and over 100 ft. in height above the valley and river which it crosses, the time required and the cost of erecting a staging from the ground-level for eleven spans would have been excessive; whereas the method adopted, besides proving very successful in its execution, was economical both in time and in cost. The author believes this to be the first instance in England of the erection of girders of such dimensions and weights by the method referred to.

In a second paper, entitled, "Notes on the Erection of Cantilever Bridges," Prof. T. Claxton Fidler, M.I.C.E., dealt with the erection of cantilever bridges by the process of corbelling forward, and the temporary stresses which take effect when the process is extended to the central "independent" span, by using its panels as a temporary prolongation of the cantilever. During this part of the process the stresses due to the weight of the structure are greatly changed—not only in the members of the independent span, but also in the cantilever. The river-arm and also the shore-arm of the cantilever are now subjected to greater bending moments and greater boom-stresses, but the more important changes are those which will generally take effect in the web-system of both arms of the cantilever, and they become especially important when the web-system consists of vertical posts and diagonal ties designed to act only in tension.

Taking any ordinary form of cantilever, of varying depth, it is shown that, while the vertical shearing force at all points in the river-arm undergoes no change under the altered condition of the structure, yet the tensile stress in the diagonal of every tapering panel is considerably less than the stress due to the same load in a completed bridge. Thus, it is possible that the tensile stress in one or more diagonals may fall to zero as soon as the corbelling process reaches a certain definite stage, and if the process goes further the stress may be reversed in direction. Any such reversal of stress would tend to induce a buckling of the lower boom, and it is, therefore, necessary to examine this contingency in detail.

To define and to simplify the problem, the cantilever is first treated as a pin-connected frame of discontinuous bars, free to turn at the joints (the diagonal ties being flexible). The arm, which projects beyond any given panel, can then be examined in respect of its equilibrium while the process of corbelling goes on; and the stability of the arm vanishes as soon as its centre of gravity reaches a certain critical point P. If the corbelling process is carried any further, the collapse of the pin-connected frame follows as a necessary consequence from the upward buckling of the lower boom at one or more of its joints.

The critical point P is determined for each panel by a simple graphic method, and serves the purpose of a metacentre, so that the question of stability can readily be determined when the centre of gravity has been found.

Passing from the hypothetical illustration, the lower boom is next considered as a continuous member following the same general outline; and the upward buckling tendency is most clearly apparent when the member is designed to follow an arched outline (convex upwards). The continuity of the member does not greatly alter the governing conditions as found in the pin-connected frame. At any stage in the corbelling process the same forces are in operation producing the same buckling tendency; and as the centre of gravity moves out to the point P, the lower boom passes under a new set of conditions. It first loses the support of those forces or reactions on which it had depended for its stiffening in the vertical plane. Then, as the corbelling goes on, the boom is subjected to positive transverse bending forces or stresses with an ever-increasing tendency to push forward the upward buckling movement.

The shore arm of the cantilever is to be treated in the same way, the anchorage force being duly taken into account; for in this arm also it is equally necessary to consider the possible contingency of an upward buckling of the lower boom under like conditions of equilibrium.

The general practical question whether the corbelling process can be carried out so far as to reach the centre of the span (or to reach any given intermediate point), without involving this contingency in either arm of the cantilever, must depend in each individual case upon the features of the design—the length and weight of the independent span, the geometrical form of the cantilever, and the curvature of its lower boom—and also upon the actual distribution of the load upon every panel of the bridge.

REINFORCED CONCRETE AT SHANGHAI.

A new reinforced concrete building has been erected for Messrs. Arnhold, Karberg and Co., at Shanghai, China.

The building is seven storeys in height and covers an area of 100 ft. by 76 ft.; the first floor being intended for showrooms, the remainder for offices. The building generally is of skeleton construction. The walls, being entirely supported on each floor, are made very light. The foundations are of reinforced concrete throughout and cover about 75 per cent. of the total area. The chimney for lighting and heating plant is of concrete, as also the stairway.

The reinforcement throughout the building is supplied by the "Kahn" Bar, made by the Trussed Concrete Steel Co. The architect for the building is Mr. Walter Scott.

Views and Reviews.

Reinforced Concrete.

Professor Turneaure has offered several contributions to the theory and practice of reinforced concrete. He has been responsible for some classic tests on beams, particularly those which showed that reinforced concrete beams cracked on the underside under comparatively light loading, thus disproving Considére's theory that concrete when reinforced was able to undergo much greater extension, so that the concrete was acting in tension long after it would have been ruptured in a plain beam. This book naturally will attract close attention. It is short compared with other books, chiefly for the reason that the historical treatment and the practical aspect of the subject, as well as illustrations of structures in reinforced concrete, have been abbreviated. The theoretical side of the subject is fairly adequately treated, and the chapters on the application of reinforced concrete in building and engineering construction are useful, and afford much information, though they cannot be looked upon as all-sufficient for designers. The authors' knowledge of the history is rather deficient, for Monier, Lambot, and Coignet are given the chief credit for the pioneer work, while Hyatt, Ward, Jackson, Percy and Ransome are but briefly referred to. Wilkinson and Edwards are not mentioned, and the information offered as regards those mentioned by the authors is in some cases incorrect or misleading, and in others beside the mark. The subject of the determination of stresses in reinforced concrete and the part played by the concrete and by the steel are elaborately dealt with. The authors offer many valuable suggestions, and their book is bound to have considerable influence on the future theoretical treatment of the subject by other engineers. A good deal of attention is directed towards what have been termed shear stresses, though they are really tensile stresses along diagonal planes, in what may be termed the web of reinforced concrete beams, but notwithstanding the fact that the authors have dealt with the subject better than is done in other books, it is still insufficient, and there are a good many points that require further elucidation. The book should be read by all those specially interested in the subject, while it forms an excellent text-book for students.

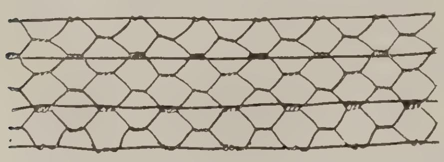
"Principles of Reinforced Concrete Construction." By F. E. Turneaure and E. Maurer. London: Chapman and Hall, Ltd. Price, 12s. 6d. net.

MONOLITHIC OR REINFORCED BRICKWORK.

Probably the majority of those who are connected either directly or indirectly with the building trade are aware of the striking results that accrue from the reinforcing of concrete with a small quantity of steel, but comparatively few know of similar results from the reinforcing of brickwork.

In reinforced concrete work it has been clearly demonstrated that (1) the adhesion of the concrete to the steel reinforcement depends upon the relative size and shape of the reinforcing members; (2) the ideal reinforcement is the one that most effectually permeates and manifests itself in the region of the fibres under stress in the concrete; that is to say, the reinforcement should be so well distributed that when the concrete is under stress the steel should effectually assist to reinforce the fibres of the concrete under stress.

These principles have been applied to the reinforcing of the mortar joints of brickwork by Mr. W. H. Brown, M.S.A., of York, with remarkable results. Many



G. 1.—JOHNSON'S WIRE MESHWORK FOR REINFORCING BRICKWORK.

experiments and tests were necessary before satisfactory results were obtained. In the early experimental stages hoop iron was tried as a brickwork reinforcement, but it was proved to be distinctly inferior for the purpose, it being weak as regards adhesion between it and the cement mortar. Its action was that of an independent body. A small mesh of expanded metal was also experimented upon, but these tests proved little better than with the hoop iron.

Finally, various forms of wire mesh were tested, and the best results from the complete series of tests were obtained with a small mesh wire lathing, 2½ins. to 3ins. wide, and made with two straight selvedges and two straight intermediate wires running the entire length of the strip, as shown in Fig. 1. This particular form of reinforcement is made by Messrs. Richard Johnson, of Clapham, and Morris, Ltd., of Manchester, and is supplied by Mr. Percy Tomey, their consulting engineer, of Queen Anne's Chambers, Westminster, S.W., in lengths of 25 yards. The selvedge and intermediate straight wires are of No. 17 S.W.G., and the mesh wires are No. 18 S.W.G. The reinforcement is galvanized after made, which not only protects the material from any possibility of rust, but also solders the wires together at the twists and selvedges, uniting all the wires together.

As will be seen from the illustration, this reinforcement has the advantage of being well distributed in the mortar joints of the brickwork, and the wires are at one and the same time at right angles, parallel, and tangential to the direction of any stress that can affect brickwork, giving both elasticity, mechanical bond, and resistance to shear.

It will be seen that the action of this reinforcement, when embedded in a mortar joist, with a weight of brickwork above it, is such that, when resisting a tensional stress in the direction of its length, the natural tendency of the reinforcement to elongate and reduce its sectional area is resisted by the mortar which has become locked in its meshes. The mortar therefore develops its greatest strength, which is resistance to compression.

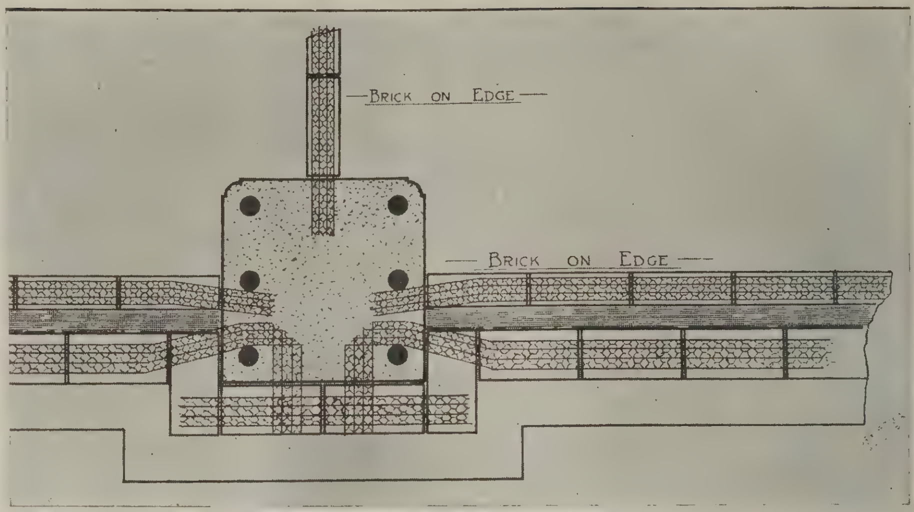


FIG. 2b. SECTIONAL PLAN OF REINFORCED CONCRETE COLUMN BONDED TO DOUBLE REINFORCED BRICK WALLS.

Reverting to the series of tests made with the material, the following particulars may prove of interest.

To ascertain the durability of the reinforcement under exaggerated atmospheric conditions, a piece of wall, 18 courses in height, was built in 3 to 1 cement mortar in the middle of a stove, and each mortar joint was reinforced with the galvanised wire lathing. The wall was built on June 7th. Heat was applied on June 14th, and the air kept continuously at 100 deg. to 120 deg. Fahr. The air was kept moist with dishes of water, and a slow stream of carbonic acid gas (CO_2) was led into the stove on June 17th and subsequent days. On July 4th live steam was blown into the stove. Water was frequently splashed over the wall, and an occasional dose of sulphur dioxide (SO_2) was introduced to give a further exaggeration of the prejudicial condition of a town's atmosphere. The first six courses were removed on July 6th, the next three on July 17th, the next three on July 24th, and the last six on August 4th. In every case the reinforcement was totally unaffected.

To ascertain the load carrying capacity of a reinforced brick wall, a hollow wall was constructed as shown in Fig. 2.

The distance between piers is ten feet, and the length of the cantilever five feet. The wall was constructed with a 4 in. cavity, the outer portion of the wall being 4½ in. thick and the inner portion 3 in. or brick on edge. There were no ties whatever between the outer and inner portions of the wall.

The wire reinforcement was introduced into every joint, and carried throughout the entire length of wall piers and cantilever.

When completed the wall was allowed to dry, and the test loads were applied in the centre between the piers and on the cantilever, the centre of the latter load being 3 ft. from the pier. The loading test was continued for three days. On the first day a load of 12,400 pounds was

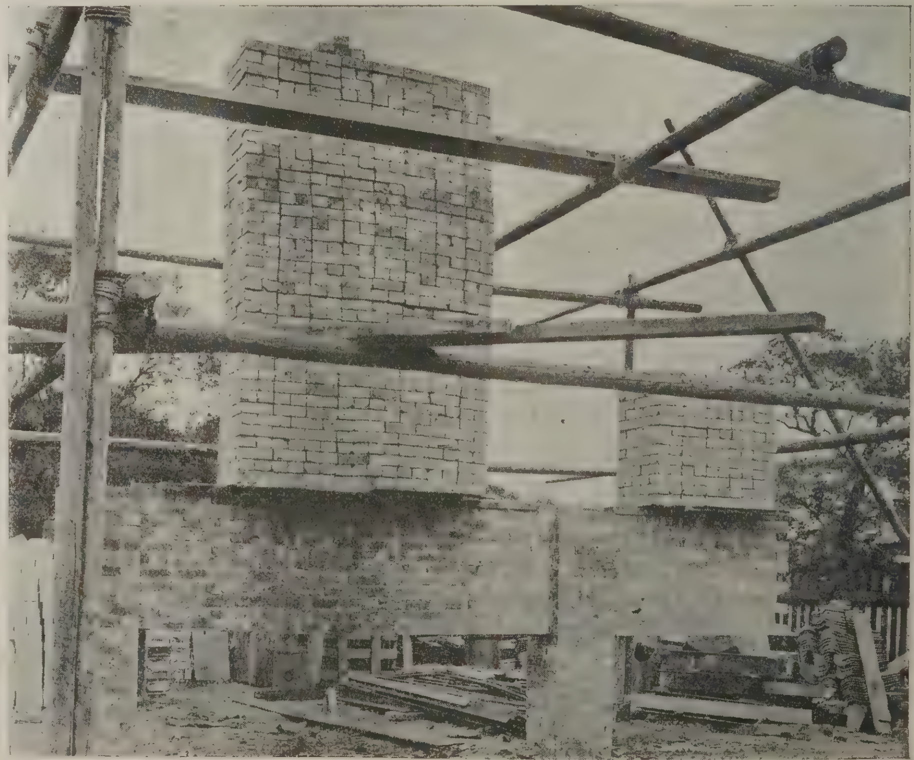


FIG. 2. TESTS ON HOLLOW BRICK WALLS REINFORCED WITH WIRE MESHWORK.

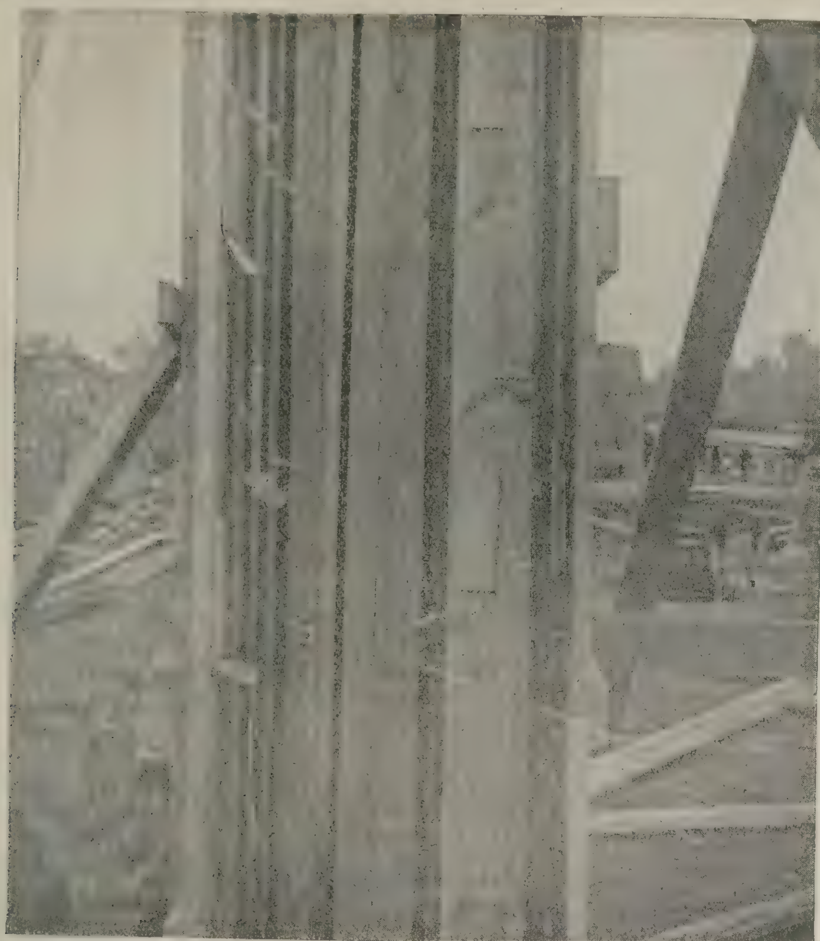


FIG. 4.—BONDING FINS IN POSITION IN FORM FOR REINFORCED CONCRETE COLUMN.

FIG. 5.—VIEW SHOWING REINFORCED CONCRETE COLUMNS, WITH BONDING FINS PROJECTING AND REINFORCED BRICKWORK IN COURSE OF CONSTRUCTION.

placed on the centre portion, and 3,500 pounds on the cantilever. On the second day the centre load was increased to 13,600 pounds, the load on the cantilever remaining the same. Not the slightest deflection was recorded with these loads. During the night following the second day a strong wind blew continuously, but on the resumption of the test on the third day there were still no signs of deflection or fracture. The loading of the centre portion was continued until a maximum load of 15,300 pounds was reached, and after waiting for two hours no deflection or sign of fracture was visible, Figure 2 shows the walls carrying these loads.

After further waiting it was decided to batter the wall with heavy stones and bricks, and after nearly an hour's battering the wall commenced to develop serious fractures under the centre load, and finally collapsed. The cantilever portion did not show the slightest sign of fracture.

A furthest test was made to ascertain the lateral resistance of the reinforcement, and a piece of brick wall 3 ft. long, 2 ft. wide, and $4\frac{1}{2}$ ins. thick was built in 3 to 1 cement mortar, reinforced in every joint, and allowed to stand for ten days. It was then laid on its side and supported at each end on a pier with a bearing of $1\frac{1}{2}$ ins., and was loaded until it failed under a load of 4,144 pounds, which equals 753 pounds per sq. ft. on the unsupported area of the slab.

Ordinary brickwork at its best is a number of units more or less indifferently placed together and incapable of resisting tensional stresses. Reinforced brickwork, however, is homogeneous, and the following advantages are claimed for it:—

(1) Reinforced brick walls do not require a continuous foundation.

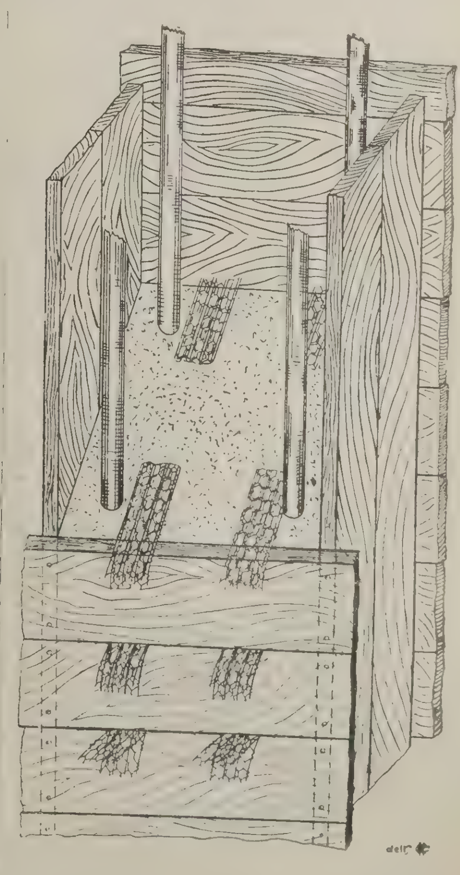


FIG. 3.—BONDING FINS PLACED IN A REINFORCED CONCRETE COLUMN.

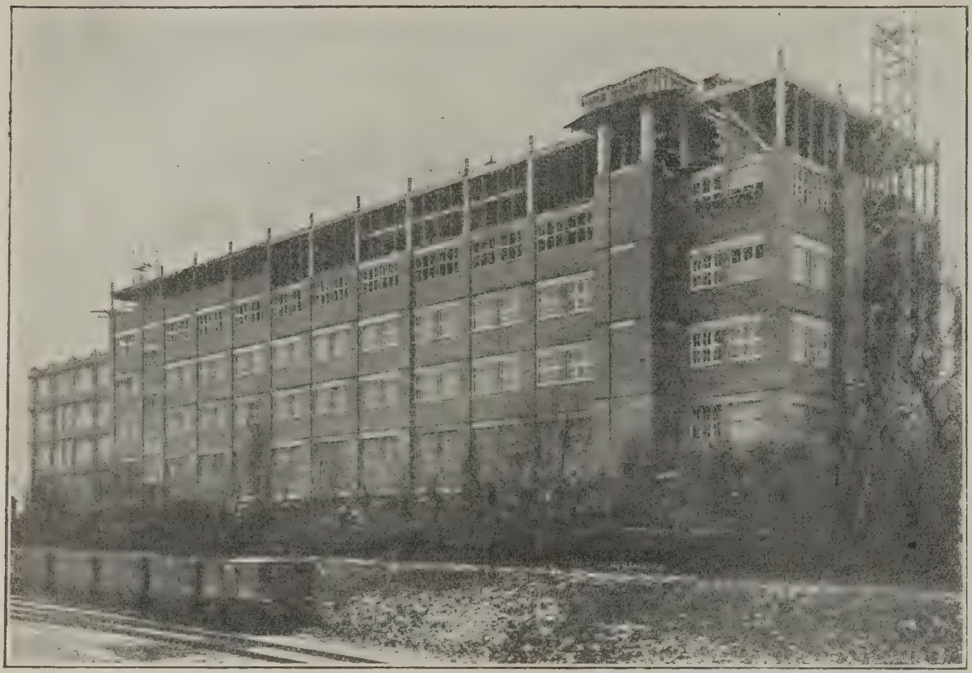


FIG. 7.—A REINFORCED CONCRETE FACTORY WITH REINFORCED BRICK WALLS AT MESSRS. ROWNTREE & CO.'S WORKS AT YORK.

(2) They support themselves and carry a load.

(3) They have a strength in proportion to their height.

(4) Buildings are rendered soundproof, fireproof, dry, and an even temperature is preserved.

(5) Striking economy in cost of structure is combined with the highest efficiency.

(6) Reinforced 9 in. hollow walls with an outer 4½ in. facing brick, and an inner common brick on edge lining, with an intervening 1½ in. air space, are *five times* stronger than ordinary 14in. walls, and cost *one-third less*.

(7) The reinforcement of the mortar joint renders brickwork as monolithic as reinforced concrete.

The application of reinforced brickwork to reinforced concrete and steel frame structure is simple, and the following particulars and illustrations of some of the work recently executed will no doubt be of more or less interest.

The ideal clothing for a reinforced concrete or steel frame building is the one which not only combines cheapness with efficiency and renders its appearance artistic and pleasing, but which also has the effect of permanently strengthening the skeleton. To obtain the latter it is essential that the stone or brick dressings and walls should be bonded into or around the concrete or steel framing in such a manner as to become an integral part of it.

It is difficult, however, to attach anything in the form of a bond or tie to a concrete column after it has been moulded or cast in timber forms or moulds. A further difficulty arises from the fact that concrete in hardening has a tendency to separate by its own shrinkage, from adjoining surfaces; thus, a concrete column, completely encased in brickwork for the purpose of bonding in the walls, dressings, or partitions, will in shrinking, leave the brickwork isolated, and all that is bonded into it. Consequently, the shrinkage of the concrete columns, plus any vibration, will rob the brickwork of its power of stiffening and strengthening the column, and may cause it to become a burden instead of a support.

The method of bonding iron ties to concrete columns by cutting holes into the columns and then making good with cement is certainly not a good one. The cement used in making good may probably shrink away from the surrounding concrete in the column, and thereby become more or less loose, and if this should happen, the effective cross-sectional area of the column is reduced at this point and the column is weakened. Further, if the concrete in the column is at all green, it is highly probable that the action of the hammering necessary to cut the hole for the insertion of the tie will destroy the adhesion of the concrete to the steel reinforcement, consequently producing a further weakness to the column.

From the foregoing facts it is apparent that the bonding to a reinforced concrete column should be placed in the concrete during the construction of the column.

The material previously described for reinforcing brickwork has been employed with every success in the bonding of walls, dressings, and partitions to concrete and steel columns. In construction short lengths of the wire reinforcements are doubled and laid into the concrete, the two free ends projecting out some few inches from the face of the column moulds or shutters, as shown in Figure 3.

Where the bonding is required on more

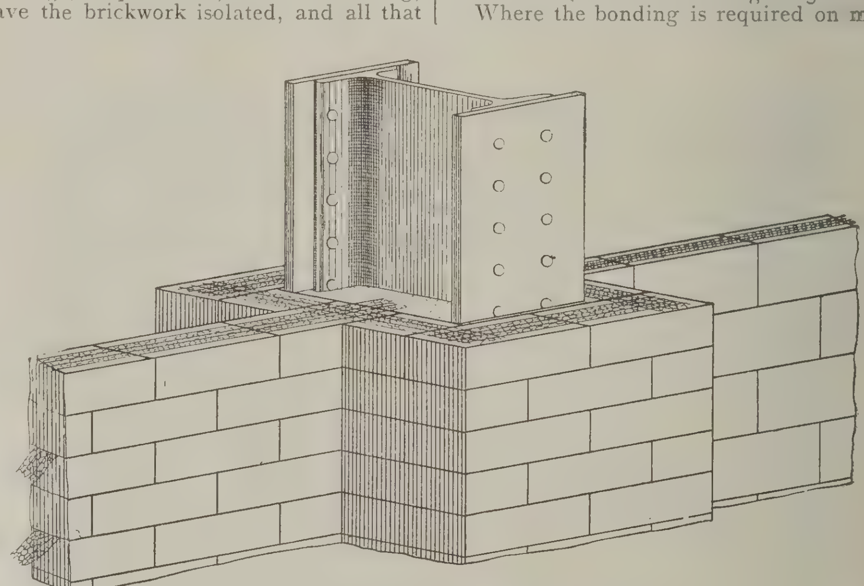


FIG. 9.—REINFORCED BRICKWORK IN CONNECTION WITH STEEL WORK.

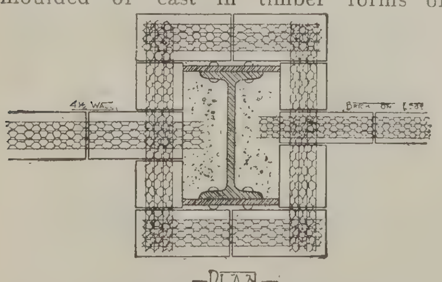


FIG. 8.—REINFORCED BRICKWORK IN CONNECTION WITH STEELWORK.

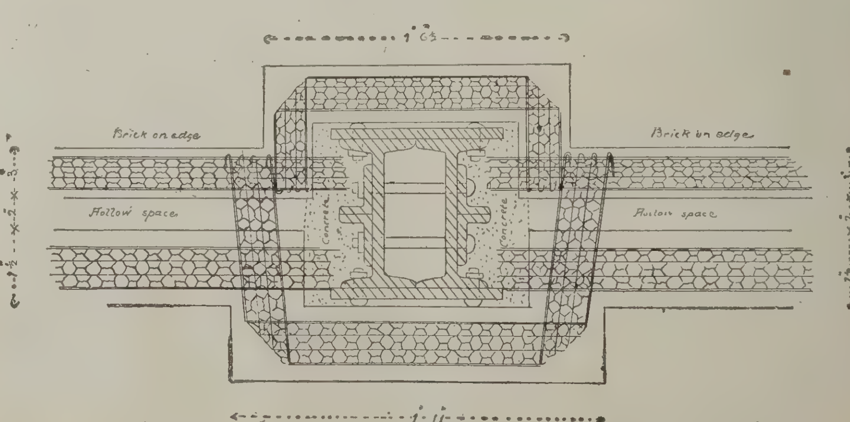


FIG. 10.—REINFORCED BRICKWORK APPLIED TO STEEL FRAME CONSTRUCTION.

than one face of the column, it is attached to the sides of the shutters or moulds as shown in Figure 4. In this method of fixing the free ends or fins of the bonds are prevented from becoming locked in the concrete, and are at the same time held in place by the thin strips of wood, as shown in the illustration.

Figure 5 illustrates a concrete column with the moulds removed, and the brick walls, encasing, and stone dressings under construction, and also shows the bonding fins projecting from the sides of the column and being bonded into the walls in conjunction with the wall reinforcement.

Figure 6 shows a sectional plan of a reinforced concrete column bonded to reinforced brickwork.

Figure 7 shows a large reinforced concrete factory nearing completion, which has been clothed in reinforced brickwork.

Figures 8, 9, and 10 show the application of reinforced brickwork to steel frame construction.

Reinforced brickwork has during the past year been employed in the construction of some of the largest mills and factories, power stations, towers, chimney-stacks, tanks, retaining walls, storm walls, boundary walls, embankments, canal linings, cottages, and greenhouses.

THE CONCRETE INSTITUTE.

We are pleased to be able to state that The Concrete Institute, to which reference was made in our previous "Concrete and Steel Section," has now been formed, and the necessary first 100 founders have been enrolled. It may be anticipated that the first meetings of the new Institute will be held next month, after which official particulars will be available for publication.

As previously stated, we think such an Institute will do much for the advancement of concrete and reinforced concrete in this country. Research work and enquiry will be facilitated, and, above all, an opportunity will be given at the Institute for men who are at present strangers to meet and discuss, both formally and informally, technical matters upon which they may differ.

We are not yet in a position to give details as to the constitution, or the names of the first 100 founders, but one point which we believe is an open secret, and pleasurable to record, is that a large number of the founders are well-known members of the Institution of Civil Engineers, a body which has not been generally assumed to be as favourable towards the development of concrete and reinforced concrete as would have been desirable.

Among the matters which we trust the Institute will take up at the earliest opportunity are the great difficulties to be met with for those wishing to erect buildings or to undertake work in concrete or reinforced concrete, so far as regulations, loan periods and by-laws are concerned—all matters of the utmost importance to the development of the subject.

We should also like to see the methods of draughtsmanship, formulæ, the principles of specifications and other routine matters of this kind assimilated, whilst as regards the reinforced concrete specialist, some basis should be arrived at to avoid too great a duplication of work when tendering on identical work.

Altogether, The Concrete Institute has a vast field before it, and if it can get through only a part of what is necessary, its formation will have been a matter of considerable value to the professions and industries concerned.

STANDARD NOTATION FOR ENGINEERING FORMULÆ.

A discussion on the subject of "Standard Notation for Engineering Formulæ" took place at a meeting of the Civil and Mechanical Engineers Society on January 2nd, and we give below extracts from the remarks contributed by various engineers.

Mr. W. Noble Twelvetrees (the president), in opening the discussion, said that he wished to state at the outset it was the hope of the Council and himself that the opinions and suggestions brought forward might serve a useful purpose by helping in some measure to pave the way for a reform which would be heartily welcomed by engineers in all branches of the profession, and still more heartily by present and future generations of engineering students. At that meeting they only expected to touch the fringes of a wide subject whose ramifications extended to every branch of physical and mathematical science, and they fully realised the fact that the influence and resources of the Society were inadequate for the satisfactory performance of so great a task as the standardisation of the symbols used in engineering formulæ of every class.

Nevertheless, the valuable support which the idea had already received encouraged the hope that the discussion might be instrumental in helping to set in motion the powerful forces which are at the command of the various influential institutions, societies, and associations representing different branches of the engineering profession; or even better by inducing the Engineering Standards Committee—a representative body which had already earned the gratitude of all British engineers by valuable work of analogous character—to undertake the work of compiling schedules of British Standard Notation for Engineering Formulæ.

Relation of Mathematical, Physical and Engineering Symbols.

In his opinion teachers and authors dealing with purely mathematical subjects might be absolved from blame in respect of the existing confusion in engineering notation. The symbols and signs employed in algebra, arithmetic, geometry, and trigonometry, stood by themselves and caused no confusion even when applied to mathematical demonstrations frequently necessary in connection with engineering problems. Similarly, the symbols employed in various branches of physical science were not necessarily to be regarding as conflicting with the symbols used in engineering formulæ. Nevertheless, it was the fact that when the domain of applied physics had been entered, various symbols became necessary for the purpose of denoting quantities which were common to various branches of that science, and to what might be distinguished as engineering practice. The symbols which teachers of physical science applied in a general sense and with much freedom to quantities of this kind were not always the same as those which engineers applied in a specific manner, and with some restriction to quantities of a similar nature. Hence the elements of confusion at once became evident. They could not reasonably expect science teachers to use one code of notation for mathematical theories and another code for practical applications of the same theories, and it was only natural that professional scientists who wrote engineering treatises should import some of the symbols which they had been accustomed to employ elsewhere.

A familiar example of importation in this way was furnished by the use of letters such as P, Q, R, and S, or p, q, r, and s, to denote forces or stresses for which engineers had already provided other and more easily understood symbols.

Unfortunately, however, engineers had not yet established by custom or otherwise a clearly-defined system of notation, and until they did so there was no just reason for imputing blame to scientists for introducing into engineering literature any symbols which seemed convenient.

The first thing that they, as engineers, ought to do was to formulate a code of notation suitable for all the factors in general use, and then to confer with those engaged in the pursuit of the more mathematical branches of science, with the object of ascertaining whether a common code of notation could be settled for such factors.

Examples from Various Authors.

The confusing state of engineering notation was illustrated by haphazard reference to half a dozen treatises by different writers on any branch of engineering work.

For example, in the department of structural engineering nearly all the factors connected with the design of beams and columns were generously provided with at least three alternative symbols, and some of them had from six to a dozen if they took into account symbols with suffixes.

This state of things was sufficient perplexing in itself, and was rendered even more so by the fact that symbols applied to certain factors by one writer were applied by other writers—and sometimes by the same writer—to totally different factors.

Thus, the student of formulæ found that *Total Loads* or *Concentrated Loads* were denoted by W, P, and F, and that P and F were also employed to represent *Tension*, *Compression*, *Shear* and *Reactions*

Shearing Force was indicated by the letters F, Q, and S; Q also stood for the *Reaction* of beam supports, and S for the *Section Modulus* and the *Sectional Area* of beams, the latter being a factor which was also denoted by a or A.

Bending Moment was represented by M and μ, these symbols at the same time standing for *Moment of Resistance*, the latter being distinguished in some books by the symbol R. In one book the latter R stood for what was there termed the *Moment of Resistance*, but the quantity actually intended was the *Section Modulus* for which other authorities provided the alternative symbols Z and S.

Authors were unable to agree even upon so simple a matter as the proper symbol for the *Depth* of a beam, some using d, others h, and others again H, this last symbol being sometimes employed for the totally different purpose of indicating *Horizontal Flange Stress*.

The *Sectional Area* of a beam was a, A, or S, according to fancy; the *Deflection* of a beam was endowed with a comprehensive vocabulary including d, D, u, v, δ and Δ. The *Deformation* of structural material was denoted by e, x, a, β, and λ, and the *Radius of Gyration* was alternatively expressed by the letters i, k, r, and k (*kappa*).

The category might easily be extended to great length, but the few examples given were quite sufficient to illustrate the chaotic state of things which existed.

Author.	Gordon's Formula.	Rankine's Formula.
Rankine	$\frac{P}{S} = f \div 1 + \frac{a\,l^2}{h^2}$ ..	$\frac{P}{S} = f \div 1 + \frac{l^2}{cr^2}$
Ewing..	$p = \frac{f}{1 + a\left(\frac{L}{d}\right)^2}$ ..	$p = \frac{f}{1 + \frac{L^2}{k^2}}$
Goodman	$P = \frac{S}{1 \times a\frac{l^2}{d^2}}$ ..	——
Anglin	$P \times \frac{fS}{1 + ar^2}$ ..	$P = \frac{fS}{1 + \frac{l}{cr^2}}$
Molesworth	$P = \frac{F}{1 + kH^2}$ ..	$P = \frac{F}{1 + kH}$
Rivington	$R_c = \frac{Ar_c}{1 + a\frac{l^2}{d^2}}$ ..	——
Atherton	$P = \frac{fA}{1 + cr^2}$ ..	——

Gordon's and Rankine's Formulæ.

The desirability of standardisation was further emphasised by the adjoined forms in which Gordon's and Rankine's well-known column formulæ are presented in some standard treatises and books of reference.

The most noteworthy of these versions are those of Molesworth, which appeared to suggest the absence of any difference between the formulæ of Gordon and Rankine, but the others were fairly distracting in respect of notation apart from the variations of algebraical form which they exhibited.

Reinforced Concrete Symbols.

A further example of the difficulties innocently caused by those who published formulæ based upon divergent systems of notation was furnished by the following small selection from the numerous equations for the moment of resistance of reinforced concrete beams, the moment being taken in each case about the centre of tension in the reinforcement.

The equations are :—

R.I.B.A. Committee .. $M = \frac{1}{2}A_c\,c(d - \frac{1}{3}kd)$ ..(1)

Marsh .. $M = \frac{cub}{2}(h - \frac{u}{3})$ ..(2)

Johnson .. $M_0^1 = \frac{P_c}{3}(3y_2 + 2y_1)$..(3)

Sabin.. .. $M_0 = zf_c\frac{y_1}{2}\left(\frac{2y_1}{3} + y_2\right)$(4)

Thompson .. $M_r = \frac{Cxbd_2}{2}\left(1 - \frac{x}{3}\right)$ (5)

Fig. 1 (see sketch) was a stress diagram which showed c, f_c, and C all represented unit compression; P_c represented the total compression in the stress area above the neutral axis, and using the notation of formula (5) was equivalent to $\frac{Cbdx}{2}$

Fig. II. was a cross section which showed the dimensions denoted by the other symbols, with the exception of A_c, which was the product of b into kd.

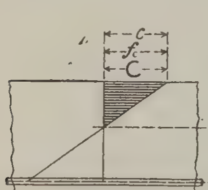


FIG. 1.

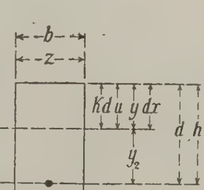


FIG. 2.

Notwithstanding their apparent dissimilarity all these formulæ were based upon the same theory, and if re-written with standard symbols they reduced to absolutely identical terms.

Thus, using the notation of formula (5), equations (1) to (4) became :—

$$\left.\begin{aligned} M &= \tfrac{1}{2}bdxC\,(d - \tfrac{1}{3}dx) \\ M &= \frac{Cdxb}{3}\left(d - \frac{dx}{3}\right) \\ M_0^1 &= \frac{\frac{1}{2}Cbdx}{3}\Big[3\,(d - dx) + 2dx\Big] \\ M_0 &= bC\,\frac{dx}{2}\left[\frac{2dx}{5} + (d - dx)\right] \end{aligned}\right\} = \frac{Cxbd^2}{2}\left(1 - \frac{x}{2}\right)$$

While the discrepancies between the equations in their original form were distinctly calculated to cause perplexity and to create distrust, the standardisation of the same equations obviated all uncertainty and imparted confidence in their reliability by furnishing unmistakable proof that all the equations were based upon the self-same theory.

Professor C. W. L. Alexander, M.Sc., B.E., Assoc.M.Inst.C.E., of Queen's College, Cork, wrote :—"The best way appears to me to be to divide the symbols into groups like the following : — (1) Forces, (2) Moments, (3) Velocities, (4) Dimensions, (5) Coefficients, (6) Constants, (7) Accelerations, etc. Secondly, I would not try to attach definite letters to anything that does not repeatedly occur—leave this to the special case. Thirdly, I would avoid double symbols as far as possible, as they are most mischievous and the source of errors often. Such are : f_r, f_s, H_o, H_e, etc. I have used them, but have given up the practice."

Electrical Notation.

Professor Andrew Jamieson, M.Inst. C.E., wrote that he wrote in 1884 a paper for the Institution of Electrical Engineers upon Electrical Definitions, Nomenclature and Notation, which was read and discussed at a meeting on May 14th, 1885.

A number of British electrical engineers also discussed this subject, and finally a Select Committee was formed, with Professor J. A. Fleming, F.R.S., of University College, London, as convener. A complete and excellent set of Electrical Definition and Nomenclature was printed and circulated amongst the members of the Committee. The part on Notation was, however, left over to be decided by the delegates from Great Britain, France, Germany, Italy, etc., who met at the 1893 International Electrical Congress in Chicago, during the International Exhibition of that year. The symbols (or notation) then recommended by the Committee and the report of the Congress on Practical Electrical Engineering Legal Units have been printed by the writer in two of his books, and have been generally adopted (with slight modifications) by most electricians and engineers. These subjects would, however, be brought forward next year for revisal by an International Committee which is to meet in London. If the Civil and Mechanical Engineers' Society could lay a similar foundation for a "Standard Notation for Engineering Formulæ," it would confer a very great boon upon the engineering profession.

Notation and Nomenclature.

Mr. E. Fiander Etchells, F.Ph.S., A.M.I.Mech.E., wrote :—"It would be readily conceded that algebraic notation in engineering formulæ was simply a species of shorthand—an abbreviated longhand in which one letter stood for a word or phrase, while the written word or phrase, in its turn, was simply a standardised symbol for a definite idea. Successive abbreviations of longhand would give in turn such forms as *diameter*, *diam*, *dia*, or even simple *d*. It would be seen that by carrying the contractions to their utmost limit the initial letter would only be left. This use of the initial letter would generally give them an unforgettable mnemonic as simple and as striking as the well-known illustrated alphabet books which formed their first introduction to the world's literature. So far all was simple, even obvious; but the real problem showed itself as soon as it was attempted to select the words which were to be cut down to their initial letters. The problem only appeared to be one of *Notation*. The real problem lay deeper; it was largely one of *Nomenclature*. Their first duty, therefore, was to agree as to nomenclature.

Mr. F. R. Durham, A.M.Inst.C.E., said a certain German Society of Engineers was taking up the question of standardisation in Germany, and was going to try to solve some of the difficulties which stood in its way. Further, the International Society for Testing Materials was trying to do something which would also go towards the standardisation of engineering expression.

Mr. C. T. Alfred Hanssen, A.M.Inst.-C.E., remarked that d as shown in one of the formulæ quoted by the President, was too easily mistaken for "differential," as used in the calculus, more especially when used together with x. Although d is used very extensively, and seemed natural for depth of a beam, it would be better to avoid it and use h instead, so much the more as this latter symbol corresponds with Continental practice.

Mr. A. S. E. Ackermann, B.Sc.(Engineering), A.M.Inst.C.E., said Mr. Ackermann objected to the use of capital letters for values in feet and small letters for values in inches because it meant a double set of symbols for the same things. If symbols were defined quite irrespective of units, then they could be used with the metric or any other system. The President had referred to Gordon's formula, and also to Rankine's formula. Gordons formula (which was *not* devised by Gorden, but by Navier, *vide* p. 340 of Cotterill's "Applied Mechanics," 4th edition) was employed in an altered form by

Rankine) and it was, consequently, very often known as the Gordon-Rankine formula, because it was Gordon's formula slightly modified by Rankine.

A Resolution.

The following resolution was passed:—"That in view of the desirability of adopting as far as possible a standard notation and nomenclature for engineering formulæ, this meeting of the Civil and Mechanical Engineers' Society requests the Council to approach the Engineering Standards Committee, the universities having engineering facilities, the leading engineering institutions, societies, and associations in the British Empire, with the object of bringing about concerted action in the matter, or to take such steps as may, in the Council's opinion, best conduce to this end."

STRENGTH OF STEEL COMPRESSION MEMBERS.

The collapse of the Quebec Bridge has attracted much attention to the compressive strength of steel struts, as it is supposed to have been one of the members of the lower chord which failed under the compressive load and caused the disastrous collapse of the whole structure at Quebec. Several interesting contributions to the theory and practice of the subject have appeared in the press, in particular, we may mention an article by Prof. W. E. Lilly, M.A., M.A.I., D.Sc., on "The Design of Struts," which appeared in "Engineering" for January 10th last, and another article by Mr. C. P. Buchanan, assistant engineer of bridges, Pennsylvania Lines West of Pittsburg, which appeared in the American "Engineering News" for December 26th.

Prof. Lilly points out that the design of a strut for a given load and length requires the cross-section to be determined and the cross-section involves its area and the radius of gyration, and thus, indirectly, its figure or shape, and the thickness. Little information has been offered by writers as to the relative advantages of different figures or shapes of the cross-section, and scarcely any reference is made as to what the economic proportions of the thickness to the radius of gyration of the cross-section should be.

The formulæ in general use do not take into consideration the ratio to be adopted between these quantities. Whether the cross-section of the strut be solid, or of large diameter and small thickness, the same formulæ are supposed to hold true in estimating its strength.

Considered from the theoretical point of view, there is for every strut of given length and load a definite area and radius of gyration, and thus, indirectly, a definite thickness, for the most economical cross-section, and any departure from these proportions involves waste of material.

For instance, take the case of a hollow mild-steel strut of circular cross-section: if the diameter is great, and the thickness small, the strut fails by wrinkling of the sides or by secondary flexure; if the diameter is small and the thickness great, it fails by primary flexure, or bending; hence it follows that for some particular diameter and thickness it will fail equally by secondary or primary flexure. A column, in which the length, diameter, and thickness are so proportioned as to obtain this result, is called an economic column, and the load it will carry for a given quantity of material is a maximum.

During the past three years experiments have been carried out in the engineering laboratory of Trinity College, Dublin. It has been shown that some remarkable wave phenomena occur in connection with secondary flexure, and subsequently that the analysis of the waves admitted of being simply expressed.

If a short hollow metal tube, with the ends truly squared, be tested under direct thrust in the testing-machine, it will fail by secondary flexure, or wrinkling, and the tube breaks up into a series of waves. From a comparison of the results obtained from a large number of tests, it appears that as the tube gets larger in diameter and the thickness smaller, the load producing failure becomes smaller, and it is not until the length of the tube becomes less than the length of one wave that the load producing failure approaches the resistance to compression of the material. Hence the true strength to compression of the tube is the load which produces the wave formation. From the experiments, and also from the analysis, of these waves it was found that the wave-length varied as the square root of the area of the cross-section. This result leads to the following equation for the limiting load:—

$$f = \frac{F}{1 + k\frac{\rho}{t}} \quad . \quad . \quad . \quad . \quad (1)$$

where

- f = the limiting load in pounds per square inch on a column of one wave-length.
- F = the strength to compression of the material in pounds per square inch.
- k = a constant $= \frac{1}{8}$ for mild steel $= \frac{1}{10}$ for wrought iron;
- ρ = the radius of gyration of the circular cross-section of the column about a diameter.
- t = the thickness of the circular cross-section.

For circular sections, which approximate to a solid bar the value $\left(\frac{\rho}{t} - 0{\cdot}5\right)$ should be used for $\frac{\rho}{t}$; for the usual sections in practice the 0.5 is negligible.

The above formula with the constants as given applies to circular sections. Further experiments on square, triangular, and other symmetrical figures show that the form of the formula is correct, the coefficient k having a particular value for each figure, and the values so far obtained indicate that the value of k is always greater than for the circular sections.

The Rankine-Gordon formula for struts is:—

$$p = \frac{P}{A} = \frac{f}{1 + c\left(\frac{l}{\rho}\right)^2}$$

- f = about two-thirds the compressive strength of the material; for wrought iron = 36,000 lb. per square inch.
- A = area of the cross-section in square inches.
- $c = \frac{1}{9000}$ for struts with round ends.
- $= \frac{1}{360000}$ for struts with fixed ends.
- l = length of strut, in inches.
- ρ = radius of gyration, in inches.
- P = total load on strut, in pounds.
- p = load per square inch on struts, in pounds.

From the inspection of this formula it will be noted that the following conditions are supposed to hold true, that the strength of the strut is proportional to its sectional area, the other terms being supposed constant; also that any arbitrary value of p can be assumed, and therefore any ratio of p/t without affecting the strength of the strut. It will be evident from the investigation on the effect of secondary flexure that these conditions do not hold true, and therefore the formula requires modification in this respect.

Now it can be shown from theory that the formula can be put in the following form:—

$$p = \frac{P}{A} = \frac{f}{1 + \frac{mf}{\pi^2 E}\left(\frac{l}{\rho}\right)^2}, \quad . \ (2)$$

where E = Young's modulus of elasticity, and m a constant, the other terms having the same significations as already given.

Referring back now to equation (1), the value of f has been shown to depend on the deformation due to secondary flexure, and not upon the strength to compression of the material. The arbitrary constant f in the Rankine-Gordon formula thus becomes a variable, and, on substitution of the value obtained for f in equation (1), the following modified formula is obtained:—

$$p = \frac{P}{A} = \frac{F}{1 + k\frac{\rho}{t} + c\left(\frac{l}{\rho}\right)^2} \quad . \ . \ (3)$$

where $c = \frac{m\,F}{\pi^2 E}$. This formula takes into consideration both primary and secondary flexure, and its solution involves the length and the figure and thickness of the cross-section of the strut. Also, by giving values to k pertaining to the different figures of the cross-section, it can be applied generally to all forms of struts.

To determine the proportions of the economic strut, it is necessary to express the thickness t in terms of ρ and the area A of the cross-section. Now the area admits of being expressed in terms of its mean length and thickness. Thus, in the case of the circular cross-secton, if r = the mean radius, then $2\,\pi\,rt = A$, also for thin section $r = \sqrt{2}\,\rho$ nearly; hence $\frac{A}{2\,\pi\,\sqrt{2}\,\rho} = t$. On substitution of this value in equation (3), and differentiating with regard to p and ρ as variables the condition obtained for a maximum is

$$\frac{\rho}{t}\,\frac{\rho^2}{l^2} = \frac{c}{k} \quad . \ . \quad (4)$$

This result gives a rapid means of approximating to the proportions of the economic strut, and with different values of k applies to all forms of cross-section.

From a careful comparison of the published tests on solid columns, the best value to adopt for m is unity, giving $c = \frac{F}{\pi^2 E}$; and if for mild steel, F = 80,000 and E = 30,000,000 the value obtained for c is $\frac{1}{4000}$ nearly; also from the experiments on secondary flexure, the deduced value of k for mild steel is 1-8th, and on substitution for the constants the modified formula for mild-steel struts with round ends is

$$p = \frac{P}{A} = \frac{80{,}000}{1 + \frac{1}{8}\frac{\rho}{t} + \frac{1}{4000}\left(\frac{l}{\rho}\right)^2} \quad . \ . \ (5)$$

In the modified formula it has been shown that for any particular figure there is some particular value of k, and when this is given, the economic proportions for the strut can immediately be determined. The question then arises as to

what form the figure should take in order to design the strut of maximum economy. Now F and c are constants in the formula, and it is the coefficient k which depends on the figure of the cross-section. If k then is kept as small as possible, the value of the load carried will be the greatest possible. So far as the investigation on different sections has gone, the value of k is least for the hollow circular sections; hence the circular sections give the strut of maximum economy.

From the analysis the coefficient k is of the form $\frac{NF}{E}$, where N represents what may be called the tabular number of the figure. The numbers for the various figures are as follows:

● 50, ■ 40, + 20, ▲ 30, I 35.

By multiplying these numbers by the strength to compression of the material divided by its modulus of elasticity, the value of k for that figure is immediately determined.

It will be noticed that in determining the constants c and k that the factor $\frac{F}{E}$ is common to both, hence it follows that the economic proportions of the strut do not depend upon F or E.

In relation to the Quebec Bridge failure we may consider a strut in which the figure of the cross-section is a square. If the sides are of equal thickness, the wave-length becomes a minimum for that particular cross-section.

Now suppose that one pair of the parallel sides becomes thin compared with the other two sides, then the wave-length increases and in the limit when the sides disappear altogether, the two thick sides become 2 separate struts. The strength, then, of a strut of this kind to resist secondary flexure is a maximum when the sides are of equal thickness. The wrinkling or crumpling up of the side of the strut introduces complications, and the laws of simple bending can no longer be said to hold true, more especially when the elastic limit is passed; also, the thinner one pair of sides becomes relatively to the other the more pronounced does this effect become. The weakness of the thin sides in bracing or connecting together the thick sides, for the transmission of the bending and shear stresses, is evident.

The effect of applying a direct thrust to a short strut of a similar cross-section to that of the lower-chord member of the Quebec Bridge, is to make the deformation caused by the secondary flexure take up a wave formation, with the result that severe stresses would be set up in the bracing.

The failure is to be attributed to the bad disposition of the material in the cross-section of the strut.

Mr. Buchanan's paper is a report on a series of compression tests he made on full size bridge members—chords and posts.

It is the largest and most important series of tests on full-size compression members for modern bridges that has ever been made.

It has often been pointed out that the working rules and formulæ for column strength used by the engineering profession are chiefly based on experiments with small models, such as the classic tests of Hodgkinson. Every engineer to-day, we are safe in saying feels the need of supplementing our knowledge of column strength by actual tests to destruction of large columns, exact duplicates of those in actual use.

Although these tests by Mr. Buchanan were made a number of years ago, they have never before been published; and, in fact, it was not until the Quebec Bridge disaster brought home to the profession the need of more definite knowledge of column strength that their importance was fully appreciated.

Mr. Buchanan's tests are notable not only for the size of the columns tested, but for the range of time over which they extend. The 19 tests extend over 14 years. Notwithstanding this, the series of tests is a coherent whole. All the tests were made by the same methods and on the same machine. The tests were made for a definite purpose: to develop methods of construction which would ensure a column stronger in its details than in the body, and at the same time give maximum crippling strength of the body. After a few early tests of Z-bar columns, eight tests of chords and posts were made before failure in the end details was eliminated.

The tests are pre-eminently working tests, not laboratory tests. The columns experimented on were shop duplicates of actual chords and posts built and erected in bridges on the Panhandle lines. The tests had the object not of demonstrating a law of columns, or illustrating one or another type of strength or weakness, but of determining the actual strength of these members.

Commenting upon these tests, the "Engineering News" says: "The designers of the Quebec Bridge credited the compression members with a utilizable strength of 24,000 lbs. per sq. in., an unusually high working value. It has been generally concluded that the failure of some of these members was due to weakness of assemblage, a compound of several single weaknesses in detail construction. This conclusion has, however, still left in the minds of many engineers the belief that the working stress was too high in any case, that it would have spelled danger even if the columns had been free from any weakness of assemblage. Yet there have been no authoritative test-figures that could be referred to as proof or disproof of this view.

"Many of the formulas for column reresistance in use even to-day are based on ultimate tensile strength, although the substitution of the elastic limit or yield point has long been advocated. It is well known that when a tensile member is stretched beyond its yield point it is permanently injured and must be replaced, hence all estimates of working strength must start from this value. The yield point of the material is even more important in the case of columns, since it is influential in determining the crippling load of the column.

"Nowhere in engineering literature, so far as we can recall, is it suggested that the crippling strength of a compressive member—the point where its final failure occurs may be *even lower* than the yield point of the material.

"The question whether such a discrepancy does occur can only be answered by actual test of full-size columns, and Mr. Buchanan's tests, representing as they do compression members, actually used in bridges, are an authoritative answer. A glance at the results shows that in every test the crippling load is considerably below the yield point of the material.

"The iron and steel used had a yield point of from 30,000 to 34,000 for iron and up to nearly 40,000 lbs. for the steel. The crippling strength of the large columns, tested, however, ranged only from 24,000 lbs. to 34,000 lbs. per sq. in., even though the series included columns so short that the column reduction effect is virtually eliminated.

"The 'short columns' of the series are so near together in length-ratio (29 to 46) that they may be taken as parallel cases and may be averaged together. The 'long' columns of the series (length-ratio 83 to 120) should be expected to show lower strength.

Two things are clearly apparent: First, that the crippling loads reached only 90 per cent. of the yield point in the wrought-iron columns and only 80 per cent. in the steel columns; second, that the "short" columns show no gain over the average. No rising tendency of the strength seems to accompany the low-length-ratios, and it is reasonable to conclude that the results represent the limiting strength of such columns, irrespective of any 'column reduction.'

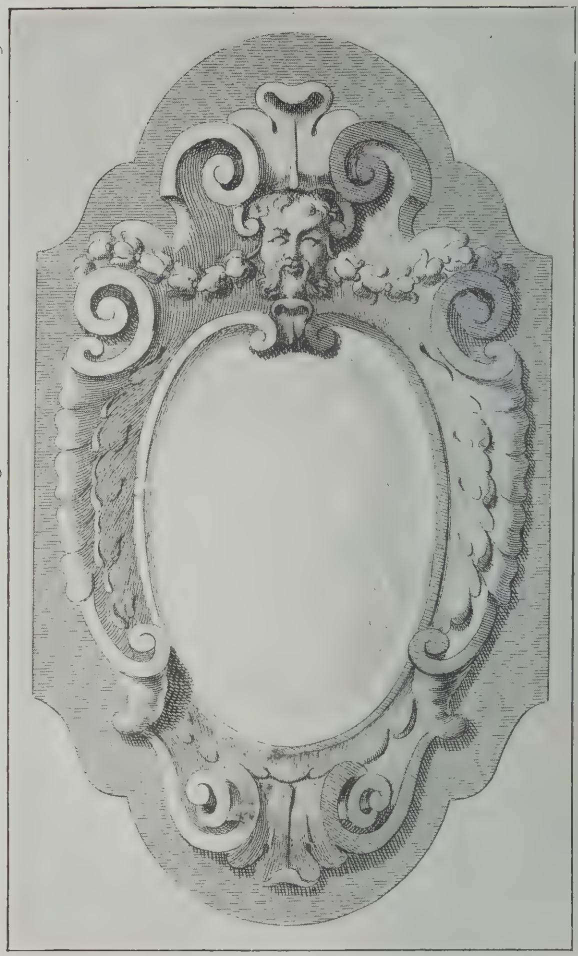
"The general result may therefore be expressed thus: Well-made wrought-iron or steel columns fail completely at loads which on the most favourable assumption will not exceed 90 per cent. of the tensile yield point of the material. A steel column whose material shows 40,000 lbs. tensile yield point will, when loaded to 18,000 lbs. per sq. in., have a factor of safety of not over 2, even if its construction be of the best type. In contrast therewith, a tension member of the same material, loaded to 20,000 lbs. per sq. in., has a factor of safety against failure exceeding 3, while against permanent deformation it has a factor of 2, which is as great as the factor of safety of the column against final collapse.

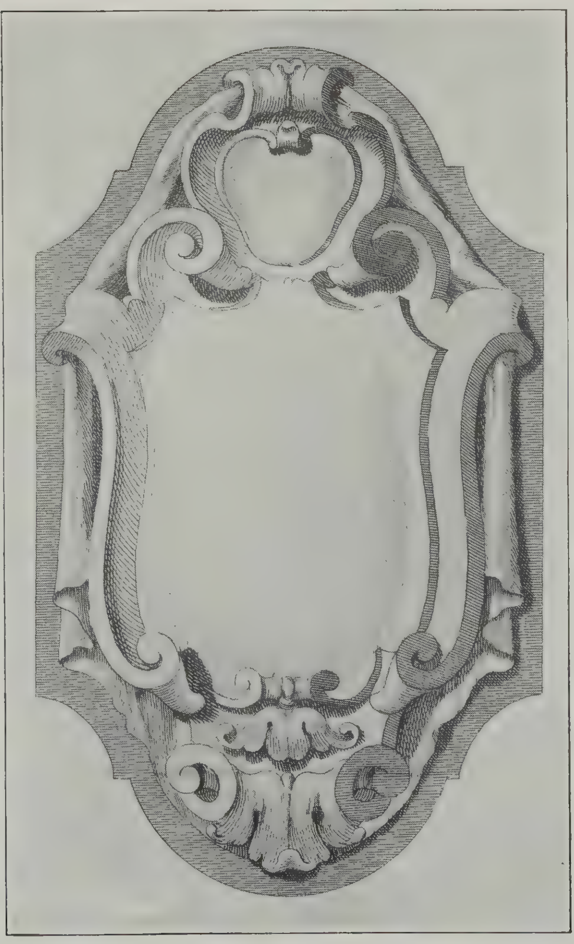
"This is the most important showing of the tests recorded. It is a most impressive warning of the danger of that gradual increase in working stresses which has been quietly going on for eight or ten years past. In column design, particularly, we are warned to return to more conservative practice.

"One other vitally important result of Mr. Buchanan's test must be noted. This is the appearance of an unmistakable yield point, or elastic limit, of the columns as a whole, and the amount of this limit, as indicated by the deformation curves.

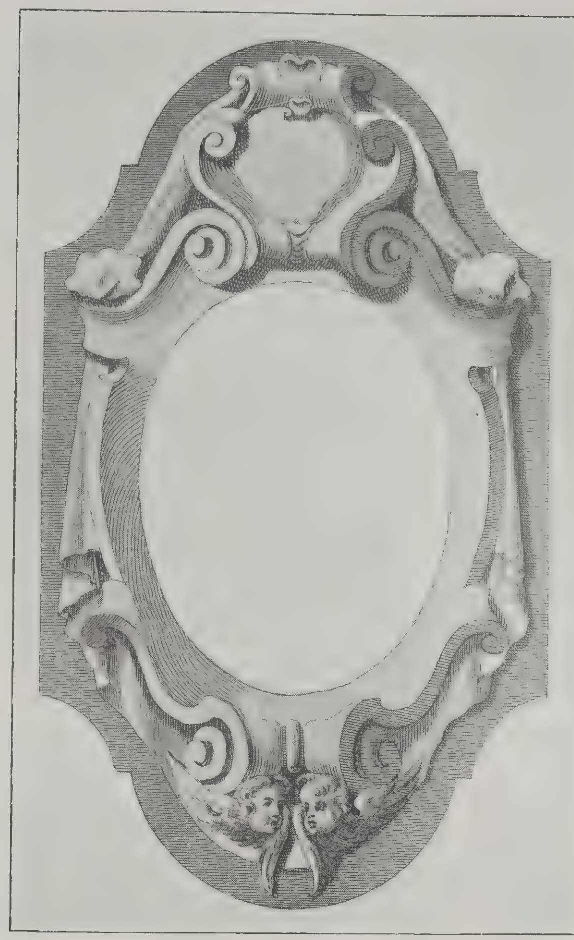
"It is clear that in the upper part of the range of column resistance there is a domain of imperfect elasticity, just as there is a similar domain in the upper range of tensile resistance. In tension tests this domain covers something more than the upper one-third of the ultimate—that is, the elastic range is not quite two-thirds of the ultimate strength. Judging from Mr. Buchanan's tests, the domain of elastic behaviour in column resistance extends little higher than two-thirds the collapsing strength.

"In conservative designing the intensities of permanent load and of repetitive loading must in all cases remain below limit of elastic behaviour. If this consideration be allowed to govern in fixing column stresses, we must take our limit not merely at .80 to .90 of the tensile yield point, as shown by the figures of crippling strength, but at .70 of this reduced value, or, say at 60 per cent. of the tensile yield point. We are then limited to about 21,000 to 24,000 pounds per square inch in steel, for the figures to be taken as the initial point in column calculations. Column reduction and the necessary margin of safety against uncertainties, imperfections, ignorance, and service contingencies, will of course bring the practical working stresses to a value much lower."





SOME DESIGNS FOR C



HES, BY JAMES GIBBS.

March 4, 1908.

Volume 27, No. 682.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 364, Westminster.

Date of Publication: The BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The "Contractors' Section" is given in this Issue.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

NOTICE.—The index to Vol. 26 of THE BUILDERS' JOURNAL can be obtained from the Publisher, 6, Great New Street, E.C., post free, for 1d.

The Preparation of Bills of Quantities.

The proposal recently made by the secretary of the Quantity Surveyors' Association to obtain more uniformity in the systems of measuring builders' work known respectively as the London and the north of England methods is primarily one that is of greater interest to surveyors than to architects. But even so, many architects practising in the metropolis and the south of England who have been engaged upon architectural work in the northern parts of the kingdom can testify to the great inconvenience caused by some of the radical differences between the two systems. The examination of a bill of quantities emanating from the office of a north country architect or surveyor by any member of the architectural profession who is accustomed to the London system of "taking off" will show, among others, the following peculiarities in the method of measurement employed: (a) the neglect to measure, or number, many items of "labour only"; (b) the inclusion of an item known as "labour to hollows" in the "bricklayer" and "plasterer" bills; (c) the deduction of the brickwork in flues and its measurement by the foot lineal, under the description of "labour forming," the number of flues to be cored and parged being also given. As to the measurement of carpentry and joinery, the northern system differs materially from that customary in London: for example, the separation of the items "for labour" from those for materials in the measurement of floors and roofs. The labour involved in framing roof trusses is measured by numbering the latter, and the "cube timber" item for the roof includes rafters, purlins, hips, ridges, roof trusses and curved ribs, the labour for framing the hips and valleys being measured by the foot lineal. In the case of a staircase very little time is expended in the detailed measurement of its component parts, the surveyor being often content with enumerating the steps and describing their length, width of tread, and height of rise, and including the wall and outer strings in the general description. With the exception that labour on leadwork, such as welts, bedding, flashing, and copper nailing, are *not* measured, and that bends and joints in pipes up to 2 ins. in diameter are included in the length measurement, other items comprised in the "smith and founder" and "plumber" bills do not vary to any considerable extent from the London method. As to the "painter" bill, a metropolitan surveyor would be struck by the absence from it of all reference to "frames" and "squares," it being customary in the north of England to measure both sides of the windows by the yard super. for the painting. The method often adopted of annotating the bills of quantities, and making them thus serve also as a specification, has many advantages. In our experience, unless the specification and the bill of quantities have been prepared by the same person, it is unlikely that they will be in absolute agreement, and there is therefore much to be said in favour of incorporating the two in one document. But whether this effort to abbreviate the work of the architect, or to avoid discrepancies almost inevitable between two documents, has created a certain amount of divergence in the method of preparing bills of quantities, or whether this divergence is merely due to old-time custom and tradition, it is nevertheless one that is a constant source of annoyance to any architect who is not thoroughly familiar with the two systems of quantity-taking now in vogue. We are aware that some members of the architectural profession consider it beneath their dignity to take even an intelligent interest in the work of the quantity surveyor, but architects are responsible to their clients for the cost of the buildings erected after their designs, and they should therefore be fully conversant with methods of measurements and builders' prices. A well-devised uniform system of quantity taking, applicable to all parts of the kingdom, could not fail to lighten the increasing burden of an architect's practice.

A Party Wall Case.

In a case of *Jacobs v. Friedlander*, tried by Mr. Justice A. T. Lawrence on February 25th, an award had been made under Section 91 of the London Building Act, 1894, in relation to a party wall. The surveyors awarded that "the south face of the new wall" (which the building owner was to erect) "shall be co-incident with the south face of the existing wall, and all thicknessing of the said wall from and above 9 ins. shall be wholly upon the land of the said building owner, with the statutory projecting footings and foundations on both sides thereof." The building owner erected the new wall, and the adjoining owner complained of an encroachment. The judge found as a fact that the wall had encroached to an extent which varied from ½ in. to 1½ ins. His Lordship manifested an opinion that in all such cases the boundary line ought to be agreed and marked out by the surveyors, even where the new wall replaced an existing wall. The building owner in this case contended that the apparent encroachment was due to the fact that the existing wall had leaned, and that the new wall, being necessarily vertical from the footings upwards, emerged from the ground-level along a slightly different line to the existing wall, but that it complied with

THE IRONMONGERS' ALMSHOUSES, KINGSLAND ROAD, LONDON, N.E.

the terms of the award, as set out, in that its face was coincident with the *true* face of the existing wall before it had leaned. The judge, though not satisfied that the wall had in fact leaned, expressed his opinion that the view regarding the *true* face of the wall was correct. In cases of encroachment the court is reluctant to allow its judgment, by a mere award of damages, practically to arrange a compulsory sale of the land encroached upon (*Krehl v. Burrell* (1878) 7 C.D. 551). It will do so, however, where the injury is small, easily estimated in money value, and capable of adequate compensation by a small money payment, and where it would be oppressive to order the defendant to pull down the offending fabric. In this case the judge, after stating that he did not in any way differ from the decision in *Krehl v. Burrell*, gave judgment for £25 with costs—the costs of one plan only being allowed, as the defendants complained of an excessive number having been prepared.

The Ironmongers' Almshouses. The proposed demolition of these buildings is a matter of extreme regret to all who are interested in the preservation of the too-rapidly decreasing artistic memorials of bygone days. The almshouses, which occupy an area of land of about an acre and a half in extent, were erected in the reign of Queen Anne—to be precise, in the year 1710—and comprise fourteen attached brick-built houses, twelve of which provide accommodation, in each house, for four inmates. The buildings are ranged around three sides of a quadrangle, open on the we t to the Kingsland Road, N.E., the central pcrtion of the east side being occupied by the chapel. Much of the attractiveness of these almshouses is due to the good proportions of the three blocks of buildings, of which a well designed wooden cornice is the dominant feature. A niche placed over the chapel doorway contains the figure of Sir Roland Jeffery, the founder of the almshouses, a past-master of the Ironmongers' Company, and Lord Mayor of London, who bequeathed the charity to be administered by the Company for the benefit of the poor. The buildings were erected and the pensions paid to the inmates with the funds provided under this bequest. It is interesting to note that when the land was purchased, in the early part of the 18th century, the sum of £200 was paid for the freehold, a payment of £20 being subsequently made for some adjoining land to be used as a burial-ground for the pensioners. The Peabody Trust has now offered to purchase the site for £24,000! Unfortunately the buildings are almost untenantable, owing to dampness, and their thorough reparation would involve the expenditure of a very considerable sum of money. However, before the proposed purchase can be completed the sanction of the Charity Commissioners has to be obtained, as it rests with them to decide whether thc purchase of the site will be beneficial to to the Trust or not. As already mentioned in these columns, a public enquiry has been held recently in connection with the proposed change of ownership of the buildings and land, at which representatives of the Society for the Preservation of Ancient Buildings, the National Trust for Places of Historical Interest or Natural Beauty, and the Metropolitan Public Gardens Association strongly urged the Charity Commissioners not to give their sanction to the sale. In the interests of the art of architecture it is to be hoped that the efforts now being made by these societies to preserve a singularly interesting building may succeed.

THE CHAPEL OF THE IRONMONGERS' ALMSHOUSES.

Correspondence.

The London County Hall.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—The most striking feature of Mr. Ralph Knott's design, from the standpoint of a fellow-competitor, is its complete subordination of every consideration to the question of cost. (I trust that in making the following observations I am not going the way of Mr. Goodyear in endeavouring to find economic refinements, as he endeavoured to show architectural refinement where such refinement is really accidental.) For example, the members' terrace which has been criticised so much reduces the estimated cost of the Embankment wall and provides some thousands of feet of space to be included within the building. This feature secures privacy to the members' terrace—a point which has not been mentioned, and one which the other designs lack. Every competitor, except Mr. Knott, must have felt the want of space at this part of the plan, and must recognise the fact that this was a very good way of getting out of the difficulty. Mr. Knott evidently did not meet with this consideration, so much in evidence on all the other plans exhibited or published, for he deliberately scoops out the central part of his Belvedere Road front, thus rendering his lighting areas ridiculously small, his council chamber being barely the area asked for, and of a bad shape acoustically; also, the auxiliary rooms around the council chamber (although admirably placed in relation to each other, except for the promenade the members will have to make in order to regain their seats after a division, and that of the chairman to his room on the Belvedere Road front) are very cramped and I think many will agree with me that the sanitary accommodation here, and throughout the building, is strangely deficient; the sanitary annexes, for example, are not provided with cut-off lobbies—an item which commonplace competitors would consider necessary, for very obvious reasons, in a building mechanically ventilated (condition No. 38).

The position of the assembly hall, admirable from an economic standpoint, and placed on a portion of the site limited as to height (Schedule B) by the altered width of Belvedere Road, is really clever (if the hall itself is not so for its acoustic properties), for it makes good use of the available land and vertical space governed by the conditions, forms an admirable ornamental screen to the main entrance, and allows the main building to rise up to the normal height behind it at this point.

Monumental treatment is not the aim of this design, but what a well-known architect has aptly termed "encyclopædism" and economy. Architects in favour of a monumental treatment would certainly not have placed their main entrance off a thoroughfare of the character of Belvedere Road, unless they were fully aware that the council intended to purchase and remove the property opposite the site at no distant date—which Mr. Knott may have had more definite knowledge of than other competitors.

The 200ft. length of corridor indirectly lighted, except from the ends, where a short length of corridor gropes towards the light and cannot even satisfy the monumental cravings of pompous councillors pandering for a bust without depriving it of its function, is a "hit below the belt" for the other competitors. I admire Mr. Knott's courage in doing this—"*L'Audace! L'Audace! Toujours l'Audace.*" He saves about 12ft. of building nine storeys in height and 150ft. in length; and he does this twice! which, everyone will admit, shows great consideration for the ratepayers' pocket.

The central portion of the front, so much abused by the majority of critics, is, I think really the most admirable portion of the design, and the flight of steps down to the river (proposed to be abolished) would prove a splendid base to the structure. The Westminster Bridge Road front is most disappointing, and the body of the building—the roof with its regimental chimneys and meagre centre-piece—breathes the source of its *raison d'etre*, "ECONOMY."

The clause, No. 34, in the conditions in reference to cost reads thus:—"The sum of £850,000 is considered sufficient to provide a substantial structure suitable to the Council's purpose, exclusive of embankment, superstructure and furniture, also of any special foundation which may be necessary." Few of the competitors ever dreamt that this clause would be so vigorously enforced, and many of the designs sent in, although unquestionably failing in this matter, could probably have been easily reduced and savings effected without seriously interfering with either plans or elevations, and, if adopted would have resulted in the selection of a building better suited architecturally, and even economically, to the Heart of the Empire than the "Monument to the Salvation of the Rates" which Mr. Ralph Knott has so ingeniously contrived.

Yours truly,

ERNEST J. DIXON, A.R.I.B.A.

Stratford, E.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—It is satisfactory to find that one of the professional journals feels free to open its columns to criticism of the recent competition award.

The selected scheme depends largely for light and air upon a system of deep enclosed courts. This is in strange contrast with the fact of wholesale removal of "insanitary areas" built upon this same court system, and the general acceptance of free light, sun, wind and air, as essentials in healthy buildings. And the four main courts contain 16 to 18 *groups* of sanitary fixtures in each, to pollute the already stagnant air. What real "disconnection" of smell, noise and shadow can exist when windows of habitable rooms and staircases stare point blank into windows of latrines 20ft. or so away? Complete "internal" drainage is a monstrous proposal for 20th century work.

There appears to be no scheme for escape from fire except from ordinary staircases, and external provision is scarcely practicable. Internal escape by way of the courts may be promptly trapped at the tunneled arrangement of exits from basements.

"A Brother Architect" quoted in your issue for February 26th cannot surely justify light "borrowed" across 29ft. rooms from the lower levels of overshadowed courts, whatever value his theory may have at higher levels.

It is to be regretted that a perspective view has been selected by the Establishment Committee, instead of a model, to illustrate the new scheme to county councillors. A cheap model would suffice for the prompt conviction of doubters as to the unwholesome and dangerous principle of the "grid-iron" plan adopted.

Whilst personally regretting the neglect of Gothic motive by competitors, I think the assessors have a claim to respect for their partialities in decorative design; but the public who pay and the profession which suffers in many ways are each entitled to claim that practical defects should be absent from a selected scheme.

In this instance defects are so grave and numerous that proper re-modelling will render the scheme unrecognisable.

Yours truly,

CHARLES CRESSEY.

Morecambe.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—As an artist who takes the greatest interest in modern architecture, more particularly in its relation to the beautifying of our capital city, I should like to record the keen sense of disappointment produced in me by an inspection of the selected design for the new County Hall.

In my humble opinion, the elevation to the river cannot lay claim to any great degree of grandeur, of elegance, or of picturesqueness—this last-named a quality which nowadays is (perhaps rightly) regarded as undesirable.

Instead of a monumentally impressive structure, or, in default of that, a building of exquisite delicacy, which would either of them be worthy of the greatest city in the world, and even prove an attraction to lovers of fine architecture in foreign lands, we are given a monotonous uninteresting front surmounted by an apologetic turret, the whole as eminently respectable as it is dull.

One can think of dozens of Continental Hotels de Ville of all sizes which, without question, are more delightful to the trained eye.

Yours truly,

FRANK L. EMANUEL.

London, W.

Railways and the Building Trade.

To the Editor of THE BUILDERS' JOURNAL.

SIR, — We have noted the article on "Railways and the Building Trade" in your issue for February 26th, and we regret to learn that an increase in rates is suggested. The greatest trouble we have in the matter is delay, especially in the case of small articles coming from the south. We have known it take a week to get a bag of bolts from London by rail, and it frequently takes four days to get a parcel from Newcastle, which is only 12 miles from Sunderland. With respect to the rates charged, it is the custom here to have our girders by boat, which we understand is a cheaper means of transit, and even more certain than the railway in its delivery. We frequently have girders and steelwork delivered here from London and Leith by boat.

Yours truly,

W. & T. R. MILBURN.

Sunderland.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Referring to the matter of "Railways and the Building Trade," the following may be of interest.

I have recently built two new lace factories at Long Eaton, some miles from Nottingham. A few years ago Long Eaton was a village: to-day it is a very prosperous urban district of 15,000 inhabitants. Many new lace factories have been built, and much of the lace making has migrated there from Nottingham. This means, of course, that the building trade has been very busy, which, in addition to the general prosperity of the place, has caused an immense increase of railway traffic. Notwithstanding this

great increase of business, however, the Midland Railway—the only railway touching the place—has scarcely any more accommodation than it had in the village days. The result is an almost incredible congestion of goods in and about the station. During my building operations there I had from ten to twenty trucks of goods per week, and several times had trucks of material pushed up into the adjoining sidings, and standing there from six to eight or ten days, while we were waiting; and as the company was quite unable to handle the traffic, for lack of yard room, *hundreds* of trucks of various goods have at times accumulated in the sidings, waiting, unable to be got at until drawn into the goods yard, which affords accommodation for about twelve trucks! Long Eaton traders have repeatedly appealed to the Midland Company to provide more facilities, and they have promised to do so, but as there is no competing railway, the trading community get scant respect. This is clearly one case where the public interest is made subservient to the convenience of the railway company.

Yours truly,
JAS. WRIGHT.

Nottingham.

"The Employer's Burden."

To the Editor of THE BUILDERS' JOURNAL.

SIR,—In the leader under this head in your issue for February 26th you have missed, I think, some important points in the case. Not only had the employers to pay compensation to the injured workman, but they were summoned by the factory inspector before a magistrate, and heavily fined for committing an offence against the Factory and Workshops Act, although the firm in question had made every provision in the way of placing chains of suitable strength and reliability at the disposal of their workmen: in fact, there were eleven chains, any one of which the slingers could have chosen, that would have been more than equal to the task of lifting the block of marble they had to move. Yet apparently these two men chose the weakest of the twelve, and so brought about the accident. Who were the culprits?—the employers who provided a large number of strong chains suitable for the work in hand, or the workmen who deliberately used a chain which, even at its best, ran too close to the margin of safety? The action was taken against Messrs. Marmor, Ltd., for failing to comply with the Home Office regulation, recently issued, applying to docks and wharfs, etc. Should the regulations recommended by the "Building Accidents Committee" to the Home Secretary become law, similar troubles are in store for employers in the building trade.

There is no excuse for an employer who does not provide safe plant, but if an accident occurs when workmen deliberately substitute improper and unreliable plant for that of a safe and reliable character, which is lying there ready for use, prosecution should not be taken against the employer, but against the real culprit—the workman.

I notice that the magistrate pointed out that there was special provision for prosecution by the employers for negligence on the part of their men, but in this case the firm had not taken proceedings: implying, I suppose, that by neglecting to take proceedings the negligence was condoned. This is a very roundabout way of bestowing justice. Vicarious punishment may exist under some conditions, but it is not generally understood as English law. The proper way to prevent wrong-doing is to punish the wrong-doer, and the law should be so framed and administered as to carry out that tenet.

Yours truly,
G.M.

The Petersburg Standard.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—In the important test case of *Alfred Lockhart v. the Owners of the "Brio,"* relating to the discharge of wood into barges, Judge Lumley Smith said: "I have been for 25 years trying to make out what a Standard of timber is." Mr. Balloch explained that it consisted of 165 cub. ft. That was a Petersburg standard. Judge Lumley Smith remarked that he had asked many timber merchants, and they had all been unable to give a clear definition.

Having this in mind, I sent a letter to the learned judge, together with a little book on timber calculation which I have written, therein accurately describing what a standard of timber is, and how the figures are arrived at.

I quite understand that even those people dealing with timber constantly do not know why the Petersburg Standard has 165 cub. ft., and if the learned judge had a difficulty, I think other people may also be interested in this.

Yours truly,
J. H. KERNER GREENWOOD.

King's Lynn.

Notes on Competitions.

A School at Yardley.

In the competition for a new school to be erected in Golden Hillock Road, Yardley, the design of Mr. John G. Dunn, of Birmingham, has been selected. The school will accommodate 420 children in each of the three departments into which it is divided, and is estimated to cost £12,400.

Acton Municipal Buildings.

The first premium, 100 guineas, has been awarded to Messrs. Davis and Oglesby (design No. 26); the second premium, 50 guineas, to Mr. T. B. Gridley (design No. 6—conditionally accepted); and the third premium, 25 guineas, to Messrs. Mackintosh and Newman (design No. 34)—all of London.

The Competition System.

At the last meeting of the Chelmsford Education Committee, in the course of some discussion as to whether there should not have been a competition for the new school to be erected in Hills Road, Chelmsford, one alderman remarked:—"The system of competition is a bad one. You get the brains of a dozen architects and only pay one. You don't put doctors or lawyers into competition in that way. Moreover, whatever your instructions are, it is useful to consult with your architect as to the plans, which you cannot do in a competition."

Norbiton Workhouse.

At last week's meeting of the Kingston Board of Guardians a long discussion took place in regard to the proposed new workhouse on the Norbiton Common Farm. Eventually the following amendment was carried by 17 votes to 13:—"That the Board nominate five architects in addition to Mr. Hope, to submit competitive plans for a new workhouse, and all prospective additions thereto, on the same design, and that economy in elevation should be a leading feature; that the said designs be submitted to an assessor, and that the President of the Royal Institute of British Architects be asked to nominate the same."

Technical College Extension, Sunderland.

The twelve designs submitted in this competition have been adjudicated upon by the assessor, whose award will come before the Sunderland Town Council at their next meeting.

Perth City Hall.

In the competition for the new City Hall which is proposed to be erected at Perth, at a cost of £25,000, no fewer than 136 designs were submitted. A special meeting of the Town Council was held on Thursday last to receive the award of the assessor, Mr. J. J. Burnet, and to make a selection. The Council unanimously adopted Mr. Burnet's award, which was as follows:—1st (£50), Mr. H. E. Clifford; 2nd (30), Messrs. Stewart and Paterson; 3rd (£20) Messrs. Campbell Douglas and A. N. Paterson—all of Glasgow.

Receiving Home, Aberdare.

At the last meeting of the Merthyr Board of Guardians it was decided to invite competitive designs for a receiving home to be erected on land adjoining the cottage homes at Aberdare.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
Mar. 7	SECONDARY SCHOOL AT LOWESTOFT.—Premiums £60, £30, and £10. Limited to architects practising in East Suffolk. Conditions from R. Beattie Nicholson, Town Clerk, Town Hall, Lowestoft. Deposit, 5s.
Mar. 9	ELEMENTARY SCHOOL AT LUTON.—Architects desirous of competing to submit names by this date to the Secretary of Education, Town Hall, Luton. Six will be selected to submit designs, and the unsuccessful competitors among these six will receive £10 each.
Mar. 13	SCHOOL AT FISHPONDS, BRISTOL, for 600 children. Limited to Bristol architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon, up to March 21st.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport.

Our Plate.

Some Designs for Cartouches, by James Gibbs.

The Book of Architecture published by James Gibbs contains, in addition to a series of very carefully prepared geometrical drawings of some of the best of his executed works (such as the churches of St. Martin's-in-the-Fields and St. Mary-le-Strand), many plates of designs for doorways, windows, towers, gateways, and other portions of buildings. This week we give eight of Gibbs' designs for cartouches, all of which are interesting, whilst two or three of the number are particularly good efforts of decorative design.

THE A.A. PLAY.

KNOW ALL MEN by these presents that in consideration of an undertaking by the Purple Patch that by the agency, mediation, interposition, intervention, intercession, instrumentality, procuration, or help of the said Purple Patch, I, SAMUEL SPARING, shall have, obtain, and receive opportunity, means, and occasion to purchase, buy, or otherwise acquire at less than market prices and free from all trade marks, impediment or obstacle whatsoever, multitudes, crowds, and heaps of objects, designs, articles, and things, the productions of certain defunct artists duly warranted as dead and hereinafter called the Old Masters: Now I, the said Samuel Sparing, do in return solemnly undertake and promise that if after the due performance by the Purple Patch of the aforesaid services, I, the said Samuel Sparing, nevertheless, and notwithstanding the said due performance of the aforesaid services, shall not succeed in winning the Competition now holden for rebuilding ALL that city of Metope in that country of Metopemania, then I, the said Samuel Sparing, will forthwith, at once, immediately, without delay, proceed in the presence of witnesses to abolish, burn, cremate, destroy, efface, fire, grind, hew, incinerate all originals copies, replicas, reproductions, forgeries, or other substances, whatsoever, being or reputed to be the work of the Old Masters or their contemporaries or copies thereof and being at present in my possession or that may be hereafter acquired by me.

Around this legal document turned the Architectural Association play—a musical prophecy, in two acts, entitled "Metopemania"—produced at the Gaiety Hotel last week.

The competition in question arose in this wise. An aged king of Metopemania had framed a law making it criminal to restore the buildings of the city, which consequently decayed to such an extent that the inhabitants were obliged to live in bathing tents during the rainy season. And so came the decision at last to remodel the whole place and to hold a great competition with that end in view. Into this competition enters Mr. Samuel Sparing (head of the firm of Sparing and Flashy), who, having at his control an army of assistants to adapt the work of the old masters of art—the "antique" antique, the "old" antique, or just antique—and having also a vast call on capital, assures himself of winning the competition. His head assistants, however, while giving the hours of daylight to his service, are working at night on their own account. It is at this point that the Purple Patch (a strange spirit in the habiliments of a reporter), having sworn to aid the

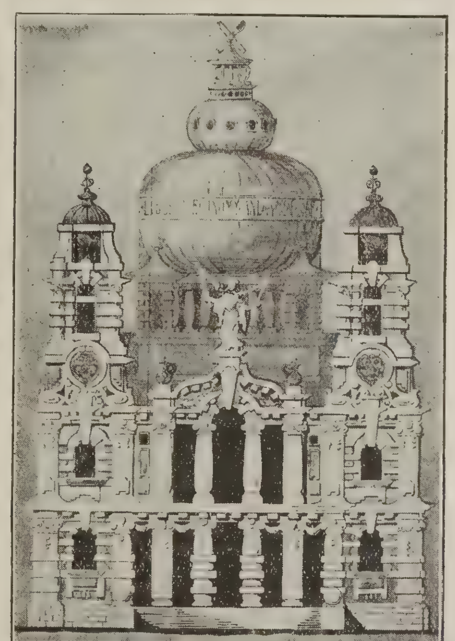
A SKETCH FROM THE A.A. PLAY BY MR. E. A. RICKARDS.

Reproduced by permission of "The Purple Patch."

assistants, induces Mr. Sparing to enter into the legal compact set forth above. This being done, the scene changes from the front of Messrs. Sparing and Flashy's premises in the Quadrant, Regent Street, to Valhalla, where, at the call of the Purple Patch, the spirits of Michael Angelo, Raphael, Wren, and a host of the Old Masters, come forth. The peculiar fact about them is that, although in Limbo's shade, they have kept abreast of modern life. Michael Angelo's style is now a mixture of Rodin and Brock and Drury, Raphael's between that of Brangwyn and Hassall, while Wren admits the limited scope of the (W)renaissance box of bricks,

And the art of Ricardo, with lofty bravado,
I strive with a touch of Art Nouveau to mix!

which explains his new design for St. Paul's, reproduced below. They each yearn, too, for some personal grati-



THE NEW DESIGN FOR ST. PAUL'S SHOWN AT THE A.A. PLAY.

fication of vanity. Mr. Sparing promises that their desires shall be met—Michael Angelo is to have a supplement in all the illustrated press,

And some two thousand fulsome words
Of critical appreciation,
Replete with Arty adjectives
Expressing soulful adulation.

Raphael's name is to adorn the society papers, and Wren is to be granted the exquisite joy of writing "F.R.I.B.A." after his name.

Mr. Sparing enters into an arrangement for the acquirement of their works, and subsequently returns to Regent Street. It is sending-in day for the great competition, and just as everything is ready and Mr. Sparing is exulting, an envoy arrives from Metopemania with a supplementary condition — namely, that a heavy duty will be imposed on every antique—which, of course, spells ruin for Mr. Sparing, and means the ultimate success (through the aid of the Purple Patch) of his three head-assistants.

So much for a bare outline of the play. It was full of good things, cleverly written and well acted, with music which, though reminiscent of some popular composers, was thoroughly enjoyable. Mr. F. Dare Clapham played the leading part of "Mr. Samuel Sparing" with great effect, and Mr. G. B. Carvill was equally good in his representation of a reporter of "The Purple Patch," while Messrs. C. Wontner Smith, J. B. Scott, and Alec. Smithers, as the three chief assistants, each did their work well. We think the play was the best which has yet been produced by the Architectural Association, and it reflects great credit on all concerned, not least upon those responsible for its mounting—including the fireproof curtain, all tattered and torn, which besought us to "Keep cool, sit tight, and see the fire out." The book of the play was embellished by some clever pen sketches by Mr. E. A. Rickards (one of which we are enabled to give).

R.I.B.A.

The Royal Gold Medallist.

A special general meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., when, on the motion of the president, Mr. T. E. Collcutt, it was resolved "That, subject to His Majesty's gracious sanction, the Royal Gold Medal for the Promotion of Architecture be presented this year to M. Honoré Daumet, Member of the Institute of France."

A business meeting was afterwards held.

The Assessing of Competitions.

The following resolution was passed:—"That this meeting approves of the principle of the jury system in assessing competitions, and refers the question to the Competitions Committee, which should report to the Council; three members to be added by the Council to the Committee for that purpose."

New Fellows and Associates.

The following new Fellows, Associates, and Hon. Associates were elected:—

Fellows.

H. M. Fletcher (London).
L. K. Hall (London).
E. Mansell (Birmingham).
Godfrey Pinkerton (London).
C. H. B. Quennell (London).
T. R. Richards (London).
W. G. Rowan (Glasgow).
M. M. Smith (London).
W. B. Whitie (Glasgow).

Associates.

A. H. Brownrigg (London).
W. T. Clarke (Liverpool).
Vernon Constable (Glasgow).
H. R. Crabb (Birmingham).
J. B. Cubey (Newcastle-on-Tyne).
F. Donaldson (Bishop Auckland).
J. W. Farmer (South Woodford).
G. H. B. Gould (Ipswich).
P. K. Hanton (London).
E. H. W. Harlock (London).
J. A. Harrisson (Liverpool).
A. J. Healey (London).
H. L. Hicks (Newcastle-on-Tyne).
F. H. Jones (Buenos Ayres).
A. S. Millar (London).
C. P. Moss (London).
S. M. Mould (Newcastle-on-Tyne).
A. Pearson (London).
C. R. Pinsent (London).
A. Pursglove (Manchester).
W. A. Ritchie-Fallon (London).
M. E. Stahl (Weston-super-Mare).
L. S. Sullivan (London).
J. H. Taylor (London).
G. M. Trench (London).
C. Trevithick (London).
P. F. Warren (Wrexham).
R. Welch (London).
G. B. Wills (London).
C. Woodward (London)
E. L. Wren (London).

Hon. Associates.

Thomas Brock, R.A.
W. J. Locke, B.A., Cantab.

CHANGE OF ADDRESS.—Messrs. Castle and Warren, architects, have removed their office from Teddington to Talbot House, Arundel Street, W.C.

* * *

MR. J. HATCHARD-SMITH, F.R.I.B.A., of 41, Finsbury Pavement, E.C., has taken his son into partnership. The firm will be known as Messrs. J. Hatchard-Smith and Son.

ARCHITECTURAL GRANITE.

(*Continued from p. 169, No. 680*).

In the first part of this article we published several views of old Gothic work carried out in granite, which illustrated how the material was traditionally treated. The general feeling of the work showed what should be done with granite. In order that a comparison may be made with these, we now give three Scottish examples, namely, a view of King Street, Aberdeen; the Aberdeen Savings Bank; and the Northern Assurance Building, Aberdeen. Later we shall give detail photographs, together with working drawings, of two of the most recent examples of granite facades in England, namely, the Ritz Hotel and the "Morning Post" building, both in London. In this modern work the detail is very different, but some feeling for the material is shown, and the buildings are striking instances of the great value of granite for modern work, although some may regard them as not particularly designed to show the material to the best advantage.

Introduction of Foreign Granites.

Mentioning the Ritz Hotel and "Morning Post" building leads us to observe that the granite in both these buildings was obtained from the Norwegian quarries of Messrs. A. and F. Manuelle. The bringing of granite from Norway is a feature which will have a great influence upon the extended use of the material in large cities throughout Europe. The Norwegian quarries possess some of the finest granite for architectural purposes, even and light in colour, with cleavage planes that allow it to be quarried with a minimum of labour, while it lies in positions that permit of its being handled for export in the easiest and most economical manner. The granite quarries lie right on the very shores of the Norwegian fiords, and large ships can be brought close alongside and the granite lifted by cranes from the mason's yard attached to the quarry directly into the ship. With such facilities it is not surprising that Norwegian granite should have taken a front place. The former conditions of the granite industry have been fundamentally altered by the availability of Norwegian granite.

The introduction of the beautiful granites from Norway, Sweden, Finland, etc., to the British market has not deleteriously affected the granite trade of this country. Indeed it has strengthened the Aberdeen market very much and made it the granite emporium of the world. If it were not for these foreign granites the Aberdeenshire granite trade would be nothing like so large as it is. The introduction of these materials has enabled the Aberdeen granite workers to successfully meet the inroads of foreign competition and to maintain their export business. One particularly striking feature is the way in which Aberdeen has been able to continue to export granite to the United States, in spite of tariffs and the competition of American granite workers.

Nearly all these granites from Norway, Sweden, etc., are what are generally termed polishing granites. Their colours, brought out under polishing, are quite as beautiful as coloured marbles, and indeed they compete with them. They particularly lend themselves for inside decorative work owing to their variety of shades and wealth of colour. As instances of their use in polished form in recent buildings, we may refer to the interior columns for the Liverpool Cotton Exchange, and various columns in the Roman Catholic Cathedral at Westminster.

Having now generally surveyed the subject of architectural granite work, we may profitably consider the sources and varieties of the material, methods of quarrying and working, etc.

Geology of Granite.

Granite is a generic term for a number of rocks which the geologist distinguishes by many names. We are not in this article concerned with the varieties that are used for road-making. We are limited solely to the rocks termed granite that are suitable for architectural work. We shall not be concerned, therefore, with so many varieties as if we included the whole of the varieties of rocks known as granite, but at the same time we cannot confine the name to what the geologist calls granite.

The whole of the rocks comprised in the general term granite are crystalline and igneous in formation, that is to say, they have been formed under pressure and heat. Amorphous igneous rocks are formed in the same way, but have not been crystallised, and in many cases, though formed under heat, have not been subjected to pressure.

Geologically speaking, true granite is composed of three different minerals: (1)

KING STREET, ABERDEEN, LOOKING NORTH.

quartz, (2) felspar, (3) mica. The first-mentioned constituent, quartz, is a hard material that may be distinguished by its glassy appearance. The second-mentioned, felspar, occurs in a variety of colours, namely, red, grey, yellow, white, or light green; it may be distinguished from quartz by its opacity and the fact that it can be scratched by a knife, whereas quartz cannot. The third constituent, mica, has also several colours, being either white, black, brown or light yellow, and it may be distinguished by the fact that it can be split up into flakes by a knife.

These are the three essential minerals composing granite, but there are often other materials present, sometimes in a large proportion. When the latter is the case, the rock becomes so different to a true granite that it is differently termed. Thus when one of the most frequently found of these minerals, namely, hornblende, is present in considerable quantity, we term the material hornblendic granite. Hornblende is white, black, brown, light, or dark green in colour; it resembles mica, though it may be distinguished from that mineral by not flaking off when the point of a knife is applied, and it is rather dull in appearance also. The other mineral which is often found in considerable quantity in granite is schorl, a black and lustrous material occurring in small patches of isolated or radiating needle-shaped crystals. When this is present in considerable quantity, the material is termed schorlaceous granite.

As we have said, the three essential materials in a true geological granite are quartz, felspar and mica. In some rocks, however, known popularly under the name granite, one of these three constituents may be replaced by another mineral. Thus, for instance, the rock composed of quartz, felspar and hornblende is termed a syenite. This appears to have been first used by Pliny to designate the coarse red granite from the quarries at Syene and adopted by the Egyptians for their obelisks and pyramids, though that was not so widely removed from a true granite as what is now termed a syenite. The Egyptian red granite was known as Lapis Syenites or Lapis Pyrrhopoecilus. Pliny says in Book xxxvi., chap. 13:—"In the neighbourhood of Syene, in Thebais, there is a stone found that is known as 'Syenites,' but was formerly called 'Pyrrhopoecilus.'"

Egyptian granite consists of large crystals of red orthoclase (sometimes in twins), and is porphyritically developed, with a little yellowish oligoclase, quartz and dark mica, and occasionally a little hornblende. The presence of the last-named led to it being formerly supposed to be syenite—a rock in which hornblende replaces the mica—but De Rozière has shown this view to have been founded on error, and that the stone is a true granite. Hornblende is only an accessory, as is also garnet and pyrites. The proportion of silica is 70.25 per cent. This granite was used for the inside polished lining of the Great Pyramid of Cheops and the monolithic Sanctuary of Sais.

The term granite is also commonly applied to rocks containing only felspar and hornblende, and also to rocks composed of quartz and felspar alone. The latter material is known as granu-

Photo: Bedford Lemere & Co.

NORTHERN ASSURANCE BUILDING, ABERDEEN. A. MARSHALL MACKENZIE, A.R.S.A., F.R.I.B.A., AND SON, ARCHITECTS.

Photo: Bedford Lemere & Co.

SAVINGS BANK, ABERDEEN. KELLY AND NICOL, ARCHITECTS.

lite, and when the materials are so disposed as to give striated markings, the material is termed graphic granite.

In granite the three materials, quartz, felspar, and mica, interlock with each other. The composition of stone containing these three ingredients varies considerably. When, for instance, the materials occur in well-defined layers, the rock is known as gneiss. When there is a somewhat indistinct tendency for the materials to be found in layers, the rock is known as foliated granite. When the rock is fairly regular in texture, except that large felspar crystals are present, so as to be very conspicuous, the name porphyritic granite is applied.

Chemical Composition.

As regards the chemical composition of the minerals forming granite, we may say that quartz is silica, which is the oxide of silicon, $Si\ O_2$.

There are several varieties of felspar found in granites. The following classification shows the average chemical composition of the various kinds :—

Kind of Felspar.

	Orthoclase.	Albite.	Oligoclase.	Labradorite.	Anorthite.
Silica	64·60	68·62	63·70	52·90	43·08
Alumina	18·50	19·56	23·95	30·30	36·82
Potash	16·90	—	1·20	—	—
Soda	—	11·82	8·11	4·50	—
Lime	—	—	2·05	12·30	20·10

It may be mentioned here that it is the felspar which determines the weathering quality of the granite. There are some varieties of granite which belie the good opinion we are accustomed to give to the durability of granite, for some felspars are unstable and may weather as badly as any limestone or sandstone. Much of the Dublin granite is, for instance, bad weathering. Felspar is chemically a silicate of aluminia combined with silicates of potash, soda, and lime.

Mica is a mineral which consists chiefly of silicates of alumina and potash with oxide of iron, soda, fluorine, and water, present in variable quantities.

Hornblende is a silicate of protoxide of iron combined with magnesia, alumina, lime and protoxide of manganese, with frequently a small proportion of hydrofluoric acid and water.

The following gives the composition of two well-known granites, physically speaking :—In Egyptian red granite there is 43 per cent. red orthoclase, 9 per cent. white albite, 44 per cent. gray quartz, and 4 per cent. black mica. In porphyritic granite from the Vosges, on the other hand, there is 28 per cent. white orthoclase, 7 per cent, reddish oligoclase, 59 per cent. gray quartz, and 6 per cent. mica.

The table below give the chemical composition of some well-known granites.

Weathering of Granite.

While we are considering the chemical composition of granites, we may profitably turn our attention to the weathering of granites, or rather the decomposition of granites, which, of course, is dependent upon the chemical composition. The influences which result in decomposition of any rock may be classified briefly as follows :—Nitrogen, nitric acid, ammonia, carbonic acid, oxygen, heat and cold, wind, water, and ice. As regards the action of heat and cold, it may be mentioned that the average rate of expansion for granite amounts to .000004825 inch per foot for each degree Fahrenheit, whereas for marble it is .000005668 inch, and for sandstone .000009532 inch. These seem minute movements thus recorded, but the fact remains that such small expansions and contractions due to rapid changes of temperature between the great heat of the sun by day and the cold at nights are sufficient to disintegrate the majority of rocks. Therefore we can understand that the influence upon granite must be very much less, because its rate of expansion is only half what it is for sandstone. All the other elements that have been mentioned play their part in the decomposition or weathering of granite. It has been stated above that felspar is the first constituent to yield, becoming white and opaque and of a friable earthy appearance. This, more often than not, is a purely physical change, due to the splitting up of the felspar along cleavage lines. It depends a good deal upon the chemical composition of the other minerals composing granite as to whether these do not decay as rapidly as felspar, but as a general rule it is the latter which gives way first. The process of decomposition is a combination of physical and chemical actions, and it would be beyond our present province to explain these in detail. The abrasive effect of wind is naturally small, as the material is so hard. The absorption of water by granite is also small, as will be seen from the data to be given in the next instalment of this article in a table of strengths, etc.

(*To be continued.*)

Kinds and Localities	Silica $Si\ O_2$	Alumina $Al_2\ O_3$	Oxide of Iron. $Fe\ O$ Fe_2O_3	Lime $Ca\ O$	Magnesia $Mg\ O$	Potash $K_2\ O$	Soda $Na_2\ O$	Titanium Oxide $Ti\ O$	Iron Sulphide $Fe\ S$	Manganese Oxide $Mn\ O$	Ignition
Biotite granite, near Dublin, Ireland ..	73·0	13·64	2·44	1·84	2·11	4·21	3·53				
Biotite granite, Silesia	73·13	12.49	2·58	2·40	0·27	4·13	2·61				
Biotite granite, Raleigh, North Carolina	69·28	17·44	2·30	2·30	0·27	2·76	3·64				
Hornblende granite, Salt Lake, Utah ..	71·78	14·75	1·94	2·36	0·71	4·89	3·12				
Hornblende granite, Sauk Rapids, Minnesota	64·13	21·01		6·90	1·26	1·22	3·31				
Gneissoid Biotite granite, District of Columbia	69·33	14·33	3·60	3·21	2·44	2·67	2·70				
Hornblende Mica granite, Syene, Egypt	68·18	16·20	4·10	1·7	0·48	6·48	2·88				
Gneiss, St. Jean de Matha, Province of Quebec, Canada ..	61.96	19·73	4·60	0·3	1·81	2·50	0·79	1·66	4·33	trace	1·82
Gneiss, Trembling Mountain, Quebec, Canada	69·24	14·85	2·62	2·10	0·96	4·33	4·30	—	—	0·45	0·70
Disintegrated granite, District of Columbia	65.69	15·23	4·39	2·63	2·64	2·00	2·12	0·31	—	not det	4·70

EIGHTEENTH-CENTURY WORK IN DUBLIN.

Georgian Society Founded.

The inaugural meeting of the Georgian Society was held in Dublin on February 21st, the Rev. J. P. Mahaffy, D.C.L., C.V.O., presiding.

The object of the Society is to preserve as far as possible, by means of photographs or drawings, a record of the artistic decorative work in panels, ceilings, mantelpieces, etc., in the eighteenth-century houses of Dublin.

Professor Mahaffy, referring to this period of architecture, said there were three general styles, each with great harmony, but with constant and interesting variations. The first was the panelled style, which consisted of panelling the walls of the buildings with oak, and having very fine oak staircases, but having no ornament to signify in the way of modelled plaster ceilings. Of that they had a great example in the Library of Trinity College—the first great building in the epoch alluded to. Then came the Palladian, or Italian style. In this the use of oak was refused, but there was an immense use of mahogany, and a great deal of ornament, in stucco or plaster work—as in Tyrone House, the Chapel of the Rotunda Hospital, in Regent House, over the gate of Trinity College, and in the Provost's House. The third style was the Adam style, roughly contemporary with the Independent Irish Parliament, during which period far the most beautiful interiors, and indeed exteriors, were built. As examples of it, he mentioned the Custom House, Belvedere House, and the Theatre or Examination Hall of Trinity College. Since the time of their erection many of the fine old houses of Dublin had been swept away, so that not a tithe of them now remained, but it was this remnant which the Georgian Society wished to picture and describe before it was gone. The Society would offer prizes for the best photographs of ceilings, walls, and staircases, and would publish an illustrated volume of such things, for which the subscriptions would pay, and a copy of which the members would receive free of cost. They wanted as many members as possible. The Society would last only three or perhaps five years, and as a historian he need hardly say how important and interesting the proposed record would be. It would restore to the architects and workmen of Dublin their true credit, which had been wholly obscured by the vulgar belief that all the good work in Dublin was done by Italians.

Mr. W. G. Strickland, Registrar, National Gallery, moved—

That the Georgian Society for recording examples of 18-century domestic architecture and decoration in Dublin be founded.

This was seconded by Sir Thomas Drew, P.R.H.A., F.R.I.B.A., and carried.

Mr. R. M. Butler, president of the Architectural Association of Ireland, moved the election of the officers, who were duly appointed.

The hon. secretaries are Dr. E. MacDowel Cosgrave, 5, Gardiner's Row, Dublin, and Mr. Page L. Dickinson, 13, South Frederick Street, Dublin. The annual subscription has been fixed at one guinea, which will entitle the subscriber to one copy of the illustrated publication—to be issued to subscribers only.

CONTRACTORS' SECTION

(MONTHLY).

RAILWAYS AND THE BUILDING TRADE.—II.

By **H. Morgan Veitch**, *solicitor to the Joint Railway and Parliamentary Committee of the "Perishables" Trades.*

(*Continued from page* 176, *No.* 681.)

For the purpose of making clear the reasons which have led to the Conference between British railways and British traders now proceeding at the Board of Trade, and the vital effect which its deliberations must inevitably have upon the commerce of this country (including the building trade), it is necessary to refer briefly to events which occurred nearly twenty years ago, when the present "class rates" for carriage of goods were fixed by Parliament.

In the year 1888 the grievances of the mercantile community came to a head, and traders of all classes complained that commerce was being stifled by the treatment which they received at the hands of the railway companies. An Act of Parliament was accordingly passed which directed the Board of Trade to revise the classification of merchandise traffic and the schedule of maximum rates and charges applicable thereto.

Now, it is obvious that a railway cannot be expected to carry certain kinds of goods as cheaply as others, and many factors have to be taken into consideration in determining what is a reasonable charge for the carriage of any particular article. Among these factors may be mentioned (a) liability to damage; (b) weight in proportion to bulk; (c) convenience of stowage; (d) intrinsic value; (e) mode of packing; and (f) convenience in handling. Consequently, goods have long been divided into various "classes," according to their nature, the rate for conveyance varying according to the "class" in which a particular article is placed. The Board of Trade has no power to vary this classification: therefore, many articles which, owing to the progressive alteration in trade conditions and methods, should reasonably be found in a class for which a low rate is chargeable, are still retained in some other class for which the railway company is entitled to demand a higher rate. Hence the discontent on this head which arises amongst traders from time to time.

It was for the purpose of revising a classification which had thus become obsolete that in the year 1888 the Board of Trade was directed by Parliament to institute a special investigation. Accordingly, for many months afterwards, Lord Balfour of Burleigh and Sir (then Mr.) Courteney Boyle held a most thorough and painstaking enquiry into the whole matter—sitting, in fact, for 85 days. The railway companies and the traders were respectively represented by leading counsel, and a vast number of witnesses appeared to give evidence of the conditions as they then existed in relation to their particular trades.

The ultimate result of this enquiry was that, out of considerable chaos, a new "classification" for goods traffic was evolved, to which statutory effect was given. This classification has remained practically unaltered up to the present day, and under its provisions almost every known article of commerce falls into one of eight classes, namely, classes 'A,' 'B,' and 'C,' and classes 1, 2, 3, 4, and 5. The lowest rate chargeable for transit is that under Class 'A,' and the scale of charge increases progressively until Class 5 is reached.

The present statutory classification of goods is therefore as follows:—

Class.	Minimum Weight of Consignment.	Services rendered by the Railway.
—		—
A	4 tons	Haulage from station to station only, in trader's own trucks
B	4 tons	Haulage from station to station in railway company's trucks
C	2 tons	do.
1	over 3 cwts.	Collection and delivery as well as haulage
2	do.	do.
3	do.	do.
4	do.	do.
5	do.	do.

In addition to the above, special further provisions for extra charges apply to particular cases, such as the carriage of small parcels (3 cwts. or less), animals, carriages, perishables by passenger train, returned empties, and exceptional articles such as those which occupy a large amount of space though of light weight.

It will be observed that Classes 'A,' 'B,' and 'C' represent the heavy traffic of the country. Class 'A' includes, for instance (provided the consignment is up to minimum weight as above), such articles as sand, gravel, coal, and iron. Class 'B,' slates, lime in bulk, common bricks, cement stone or cement in blocks or slabs, etc. Class 'C,' glazed or enamelled bricks, glazed drain pipes, ground glass, bolts and nuts, corrugated or galvanised iron, iron pipes for gas, water, air or steam, iron or steel roofwork (as specified), etc.

Of these classes 'A' represents the lowest rate. The rate for goods in Class 'B' is somewhat higher, and that for Class 'C' is higher still.

If we now turn to Classes 1, 2, 3, 4, and 5, we find the same principle is followed, but one meets with a somewhat different variety of article, and the minimum weight is much less, being fixed, as shown above, at over 3 cwts. The class to which, among these five, the lowest rate applies, is Class 1, which includes builders' instruments not new (as therein specified), slate chimney-pieces not enamelled or polished, chimney pots of earthenware or fireclay, doors and door frames of iron or steel, glue, iron ladders, marble chip pavement, old or scrap lead, vent pipes, sinks or sink traps of earthenware or fireclay, timber by measurement weight, white lead, etc.

Class 2, involving a somewhat higher rate, includes iron balusters, iron or steel hinges, wooden ladders, paints (in casks or iron drums or in tins packed in cases), common paper-hangings (in bales), iron window frames packed in cases, iron or steel window shutters, zinc bars. Class 3 is again higher, and includes baths, paper blinds, spun or stamped brasswork (packed), sanitary castings of iron or steel for public urinals and water-closets, wooden cornice poles in bundles (without rings or ends and not gilt), many varieties of hardware, joiners' work (common wood)—such as beadings and mouldings, not gilt, lacquered or varnished; doors or door frames, fittings and fixtures for buildings, staircases, balusters and handrails, window sashes and frames and shutters, paper hangings generally, gas or oil stoves, carpenters', joiners' or masons' tools, etc. Class 4 is still higher, and includes iron or zinc chimney tops, grates, ovens, ranges or stoves (polished), porcelain, carved stone for interior decoration, stoves (fireclay, tile), etc.

Class 5 is the highest of all. It includes chandeliers and gasoliers, empties of various kinds, stained, silvered or plate glass; ornamental cut-glass for doors, cast-iron overmantels with mirrors, carved woodwork for interior decoration, etc.

In actual practice certain alterations are made by the companies in what is known as the Railway Clearing House Classification.

The railway charges for an article vary considerably according to the particular class in which it is placed.

Having, it is hoped, now made clear the position with regard to "the classification of goods," it may be explained that each railway company is entitled to charge a certain maximum rate (varying, as before stated, with the class), according to the distance which goods are carried. These rates also differ in the case of different companies, turning partly on the cost of construction, having regard to the nature of the country traversed, but they are, nevertheless, fixed by Acts of Parliament which were mostly passed between the years 1890 and 1892. The maximum rates were intended to cover all contingencies (when cost of material, for instance, should rise especially high), and it should be noted that these statutes did not state that the rates scheduled by them should represent the *ordinary* charges, but enacted that they should represent the *maxima* in all circumstances.

Scarcely, however, had these maxima been fixed than the railway companies (about the year 1893) raised their charges—in many instances to the topmost point allowed by the statutes, quite irrespective of any special increase in expenses; this factor, indeed, intended to be covered by the latitude allowed, was wholly absent. Once more a storm of indignation arose from the trading community, and again Parliament came to the rescue by enacting (in 1894) that the somewhat lower rates as they stood on December 31st, 1892, must not be increased without just cause, and that if any such increase were made after that date it should not be allowed to stand unless the railway company could prove to the satisfaction of the Railway and Canal Commissioners that some special circumstances had arisen which would justify such increase.

This preliminary sketch of the subject may assist readers to understand the importance of the resolution adopted in January last by the railway companies (acting in concert as the Railway Companies' Association) to "promote a con-

ference with a view "to raising and adjusting the existing railway rates," as stated in last week's issue of this journal. Since the year 1904 the companies have frequently raised a rate here and there, and in most instances they have succeeded in "justifying" the increased rate before the Commissioners. But, with their strength increased by combination, they are apparently no longer content to thus add burdens retail on to the shoulders of the long-suffering trader. They now wish to raise rates wholesale. This can be effected in various ways and especially

(a) By obtaining leave to increase their maximum rates, either generally or as against certain trades.

(b) By obtaining leave to transfer articles from one class to another, either generally or in the case of certain trades, and

(c) By entering into "pooling agreements" whereby competition is removed so that a low rate which might previously have been defended on the ground of "competition" becomes indefensible if a complaint of "undue preference" is made by traders residing in a non-competitive district.

Of course, any complaint made by the latter class could be removed by reducing their rates to the level of those in the competitive area, but naturally, the railways prefer to *level up* rather than level down! It is, in fact, partly on these grounds that traders are now opposing before the Railway Commissioners the proposed pooling agreement between the Great Northern and Great Central Railways, but comment on the merits of this particular case is at present impossible, owing to the matter being now *sub judice*

Speaking generally, however, as to the desire of the railway companies to put up rates all round, the question arises as to how their powerful attack in combination is to be met by the trading community. Obviously there is only one weapon available; combination must be met by combination, and attack must be repulsed by counter-attack. Traders contend that, if rates are to be altered, the commercial interests of the country must be considered: they urge, in fact (a) That rates should be lowered rather than raised (at all events in the case of most trades), and that if rates are to be raised in any direction there are many trades which must be left unharmed if they are to be protected from virtual ruin. (b) That the existing classification of goods has again become obsolete, and that there are many articles which ought to be transferred from their present class to some other class, so as to extend to them the benefit of a lower rate. (c) That if pooling agreements are to be sanctioned, the reduction in expenditure effected by the elimination of competition should be apportioned fairly between the railways and the traders (instead of being wholly retained by the railways) especially if a less efficient service should result, as they contend will be the case. (d) That steps must be taken to ensure that pooling agreements to be adopted wholesale shall not result in the railway service of the country becoming merged into one vast and all-powerful monopoly, and that, in fact, some check should be placed on the working of the Railway Companies' Association, which already tends to achieve this result.

The above are amongst the subjects which will come up for discussion at the present Conference, upon which the building trade as a whole is, unfortunately, quite unrepresented. Possibly it is not yet too late to induce the President of the Board of Trade to add to the number of traders' representatives, as, in reply to a deputation on Wednesday last, he intimated that further additions might yet have to be made.

In addition to the matters of general hardship above referred to, it is clear that there are many other grievances suffered daily by traders at the hands of the railway companies, which call urgently for rectification, but as it is proposed to consider these in some detail the matter must be dealt with next week. Meanwhile, traders who contend that any given article of commerce in which they are interested should be placed in a more advantageous class, or at least ought not to be removed into a higher-rated class, should write to the Editor of this journal, giving particulars, together with the reasons for their contention.

(*To be continued.*)

LEGAL ENACTMENTS AFFECTING SCAFFOLDING.

At the School of Architecture of the Regent Street Polytechnic, a lecture on the legal enactments affecting scaffolding was delivered recently by Mr. A. G. H. Thatcher, of the Home Office.

In commencing his lecture, Mr. Thatcher pointed out that these enactments were of two kinds, namely, those enforceable by the local authorities, and the duties imposed on builders by the Factory and Workshop Act, 1901, and the Notice of Accident Act, 1906 (which are enforceable by the Government departments).

The duties of the local authorities are mainly for the safety and general welfare of the public. Such regulations, however, are by no means in general use. Many of the larger Corporations and similar bodies in England have acquired powers in this respect, but not to the extent that would be imagined, considering the necessity for such measures. The Corporation of London have considerable powers, and their regulations may be taken as a model.

When making application for a license to erect a scaffold, a printed form has to be obtained from the Engineer's Office at the City Guildhall, and, after being filled in, has to be returned. On the form must be stated the place of erection, for what period, the nature of the work, and length of scaffolding required. The regulations for enforcement, which are in the hands of the Inspector of Pavements, cover many details: the principal ones are—that no scaffold is to project beyond the footway pavement where it is narrow, nor more than 6ft. where it is wide enough to admit of such projection; any deviation for special reasons is to be stated on the license granted after the application has been made; no scaffold may be enclosed to prevent passengers passing under it, and, for their protection, the lower stages are to be close or doubly planked, and each stage is to be fitted with fan and edge boards; and the Inspector may also ask for further precautions to be taken if he considers these to be necessary in order to prevent dirt or wet falling, or for the public safety.

Where practicable or needed, a boarded platform at least 4ft. wide, with post rails and wheel curbs (or fenders, as they are sometimes called), are to be constructed outside the scaffold, as the Inspector may direct. When required also, a gantry, stage or bridge is required to be erected so as to allow foot passengers to pass beneath it; the gantry is to be doubly planked for the prevention of rubbish or water falling on those passing below; and the public way is to be kept clean to the satisfaction of the inspector. No fire hydrants are to be enclosed so that they cannot be used, and the scaffolds are to be watched and lighted by night. Permission must be obtained to enclose a public lamp, and, if this is granted, temporary lamps must be put into use in its place.

It will be seen that these regulations are provided for public welfare, and although some protection may, and probably does, result for the workmen, yet that is not the primary intention of the enactments.

In Scotland, where the Burgh Police Act of 1903 is in force, a section of that Act, enforceable by the Dean of Guild Court, gives power to prohibit or stop the erection, use or employment, and to order the alteration or removal of any crane, scaffolding, staging, or shoring, in or connected with the construction or erection or the demolition, alteration, repair, or securing of any new or existing building, where such crane, scaffolding, staging, or shoring is or is likely to be, in the judgment of the burgh surveyor, a source of danger. In this case, again, the intention is to safeguard the public, although the workmen, as before, would benefit to an equal extent.

The provisions of the Factory and Workshop Act, 1901, which apply to buildings in course of construction or repair (but not, it should be noted, to those in course of demolition) are mentioned in section 105 of that Act. Briefly, the sections which apply are:—

Section 17, which gives power to make orders as to dangerous machines; Sections 79-86, which give power to the Secretary of State to make regulations as to dangerous trades; and Section 136, under which fines can be inflicted in case of death or injury. Sections 19-22, regarding accidents, have now been repealed, their place being taken by the Notice of Accident Act.

These sections apply to any building as a whole, provided machinery is used upon it, but if there is no machinery in use—that is, machinery driven by power—the powers of the Act are further limited. In such cases the provisions as to accidents only apply, and even then only to such buildings which exceed 30ft. in height and which are being constructed or repaired by means of scaffolding.

The measurement of a building as to height has been the cause of much controversy in the past, but in a case taken to the Court of Appeal in 1901 under the Workmen's Compensation Act of 1897, in which the same limitations as to height were mentioned, the bottom of the footings was given as the point from which measurements were to be taken. (It may here be pointed out that in the Workmen's Compensation Act, 1906, no class of building is ruled outside of the Act, whether scaffolding is in use or otherwise.)

The specified powers of the Factory and Workshop Act have no definite relation to scaffolding other than to buildings considered as a whole, and it is not necessary, therefore, to further consider them, except in one particular, i.e., the power of the Secretary of State to make regulations for dangerous trades. If any regulations are made to deal with the dangers inseparable from the erection of buildings,

it is obvious that to a large extent they must affect the scaffolding required. No regulations have as yet been made, but the recently issued report of the Committee appointed by Mr. Gladstone in 1906 to consider the necessity for such action contains the conclusion that such regulations are required, and 46 draft rules are suggested for observance, a large proportion of which deal with scaffolding. (These draft regulations were set out in detail in THE BUILDERS' JOURNAL for January 8th last.)

As already mentioned, Section 19 of the Factory and Workshop Act, which dealt with the notification of accidents, has been repealed, and replaced by the Notice of Accident Act, 1906, the fourth Section of which Act states that where an accident occurs which is either an accident causing loss of life, or an accident disabling a person for more than seven days from working at his ordinary work, written notice of the accident shall be sent to the Factory Inspector for the district, and, if death takes place, also to the certifying surgeon. If the notices are not sent, a fine may be incurred not exceeding £10. The name of both the Factory Inspector and the certifying surgeon can be ascertained by application to the Home Office.

[In arranging the series of lectures on scaffolding, by Mr. Thatcher, the Regent Street Polytechnic has added to its reputation. In the report of the Building Accidents Committee, which has been dealt with in our columns, a reference is made to the necessity of proper teaching being required for those engaged in this vocation. It is only to be expected that such a hint would soon meet with a ready response, and the immediate attention paid by the Regent Street Polytechnic is indicative of the intention of the managers to keep abreast of the times, and has established a lead which will undoubtedly draw the attention of other technical authorities in this direction. There is no reason why the movement should not spread. Too long has this work been in the hands of unskilled men.—ED. B.J.]

Builders' Notes.

MESSRS. HOLLOWAY BROTHERS' CLAIM FOR £230,000.—In connection with the projected London County Hall, a claim of £230,000 compensation is made by Messrs. Holloway Brothers, Ltd., builders, lessees of Victoria Wharf (included in the site). The claim is made up as follows:—Land and buildings, £60,000; fixed machinery and fixtures, £15,000; removal of fixed plant and stock and depreciation, £4,500; two years' rent of new premises, £4,500; time of principals, £2,250; loss of trade, upwards of £130,000. When Messrs. Holloway were turned out of their premises, said counsel at the enquiry held last week at the Surveyors' Institution, there would be no other place to which they could go between Battersea, up the river, and East Greenwich, down the river. The matter is still proceeding.

Referring to the reports in the Press in regard to the fire which occurred at their works in Belvedere Road on Tuesday evening, February 25th, Messrs. Holloway Brothers write pointing out that the fire was, owing mainly to the promptness and energy displayed by the Fire Brigade, practically confined to the destruction of one stack of timber, the buildings not being affected in any way, and business was resumed without any interruption on the following morning. "From a perusal of the papers one might be led to suppose that the fire was most serious, but such, we are happy to state, was not the case."

MESSRS. PATMAN AND FOTHERINGHAM, LTD., have secured the contract for extensive alterations and additions at the Albemarle Club, Dover Street, W. (Messrs. Smith and Brewer, architects).

WEIGHING MACHINES. — We have received from Messrs. Hodgson and Stead, Ltd., of Manchester, a catalogue of their weighing machinery. Contractors and others will find this of interest.

THE NATIONAL ASSOCIATION OF MASTER MONUMENTAL MASONS AND SCULPTORS.—The annual general meeting of this Association will be held at the Manchester Hotel, Aldersgate Street, London, E.C., on Monday, March 30th, at 12 noon. The meeting will be open at 5 o'clock to non-members, provided they are master monumental masons.

CARPENTERS AND JOINERS COMBINE.—It is reported that two important trade unions have decided to join hands. One is the Amalgamated Society of Carpenters and Joiners, which has branches all over the kingdom and in the United States, and the other is the Associated Carpenters and Joiners' Society, which is purely British. Great working economies are expected to be effected by the combine.

PATENT VICTORIA STONE.—The report of the Patent Victoria Stone Co., Ltd., for the year ended December 31st last, submitted at the meeting held in London on Saturday last, states that the net profit for the year, after making the necessary provision for depreciation, amounts to £6,822, to which is added the balance brought forward—namely, £2,259—making a total of £9,081. An interim dividend of 5 per cent., less income-tax, was paid in July last. A further dividend is now to be paid, making the dividend for the year $6\frac{1}{2}$ per cent.

IRISH EXHIBITION BUILDINGS FOR SALE.—On Wednesday next, March 11th, the buildings of the Irish International Exhibition at Dublin will be offered for sale by public auction. A catalogue giving full particulars can be obtained, price 1s., from the Secretary of the Exhibition, Mr. W. F. Dennehy, Herbert Park, Ball's Bridge, Dublin, or from the auctioneers, Messrs. Wheatley, Kirk, Price and Co., Albert Square, Manchester; 46, Watling Street, London, E.C.; and 26, Collingwood Street, Newcastle-on-Tyne.

A GALLON OF "MINERVA" PAINT FREE.—Messrs. Pinchin Johnson and Co., Ltd., of "Minerva" House, Bevis Marks, London, E.C., offer to send free to any applicant one gallon of their well-known "Minerva" paint, on the condition that the applicant purchases one gallon of "Satinette" white enamel at the usual price—20s. "Minerva" paint is guaranteed to be made of genuine white lead (carbonate) and white zinc (oxide), ground by powerful mills into best refined linseed oil and pure American turpentine. The finest pigments only are added for colours, while a special dryer is dissolved in the turps, making the paint sharp, without affecting its purity or easy working flow. There are 24 standard colours, from which a further 96 shades can be produced with mathematical exactitude.

MESSRS. ROBERT MCALPINE AND SONS, contractors, of Glasgow and London, have recently secured two important contracts. One is for the construction of a new dock for the British Railway Co., at Methil, Fifeshire; the contract sum for this is approximately half a million, and the time to be taken $3\frac{1}{2}$ years; the engineers are Messrs. Blyth and Westland. The other contract is for a large factory at Kinlochleven, Argyllshire, for the British Aluminium Co., Ltd., in the construction of which reinforced concrete on the Coignet system will be employed very largely. It is being built under the superintendence of Mr. W. Murray Morrison, technical adviser, and Mr. Alban Scott, architect to the company. The total cost of the factory and its appurtenant works will not fall far short of £100,000.

THE COMING TIMBER FAMINE.—Speaking at a meeting in Crieff last week, Mr. Lewis Miller, an extensive dealer in timber, and personally familiar with Norway, Sweden, Finland, Russia, Canada and America, said he had no hesitation in affirming that the forests of these countries were nearly exhausted, and in twenty years hence there would be an unparalleled timber famine. There was imported annually into this country £40,000,000 worth of foreign timber. All the British railways were supplied with sleepers from Russia, about four millions of them being required every year. But it took ninety millions of sleepers to supply the annual requirements of the American railways—enough to make a forest one mile wide and 3,000 miles long. That gave an idea of the enormous consumption of timber going on in the world, and how quickly the remaining forests were being cut down.

Law Cases.

COLLAPSE OF A HOARDING: £680 DAMAGES.—In the King's Bench Division of the High Court of Justice on February 25th, a caretaker named Miss Wright brought an action against Messrs. S. Pearson and Sons, Ltd., contractors, in respect of certain injuries caused to her by the fall of a hoarding. It appeared that the plaintiff was cleaning the steps of a building in Woolwich when the hoarding fell (it had been erected by Messrs. Pearson in connection with some public drainage works), fracturing her leg and inflicting other injuries. The jury awarded the plaintiff £680.

BUILDER'S CLAIM FOR EXTRAS.—At the Town Hall, Barnsley, last week, Mr. Butler Wilson, F.R.I.B.A., appointed by the President of the Leeds and Yorkshire Architectural Society, sat as arbitrator in the proceedings brought by Mr. R. Ruffles, a local builder, against the Barnsley Education Committee in respect of a claim for £291 outstanding for "extras" in connection with the erection of the Doncaster Road council schools. The architect for the schools, Mr. E. W. Dyson, had certified that the sum of £12 only was due, and he had issued his final certificate for that amount a year ago. In cross-examination, Mr. Ruffles admitted he had made mistakes in his original contract, and also that while he had quoted the making of drains 3ft. deep at 1s. 10d. per yard, he quoted 2s. 7d. per yard for drains 2ft. deep. In the same way he had made an error in quoting for the building of walls, for, whereas he quoted 7s. per yd. super. for walls 20ins. thick, he quoted 4s. 2d. per yard for walls 16ins.

thick. He also admitted there was an error of £146 in respect of concrete work, but he disclaimed responsibility for this. He also denied that he had made alterations in the prices of the quantities. Mr. Robert Dixon, architect, of Barnsley, gave evidence in support of the claim. The amount of the extras—6 per cent.—he regarded as low, 10 per cent. generally being a reasonable figure for extras.—The hearing was adjourned.

New London Buildings.

The following applications have recently come before the London County Council, their refusal or consent being stated in italics:—

Erection of buildings on the western side of Lyham Road, Brixton, on the application of Dartnell and Banks, on behalf of E. Gray (*refusal*).

Erection of a one-storey shop in front of No. 40, East India Dock Road, Limehouse, on the application of C. Dunch, on behalf of A. F. Smith (*refusal*).

Erection of a motor house at Oak Hill Lodge, Oak Hill Park, Hampstead, abutting upon the footway leading from Frognal Rise to Redington Road, on the application of P. Morley Horder *consent*).

Erection of a parochial hall on the southern side of Alfred Street, Bermondsey, on the application of E. Crosse and Co., on behalf of the Building Committee of St. Luke's Church (*refusal*).

Erection of a stable building upon a plot of land approached as a passage-way leading out of the north-eastern side of Himley Road, Tooting, on the application of H. Wakeford and Sons, on behalf of W. Watson (*consent*).

Erection of an addition at the first-floor level of Temple House, Tallis Street, City, on the application of Gordon and Gunton, on behalf of Sir Horace Marshall and Son (*consent*).

Erection of a house on the northern side of Woodwarde Road, Dulwich, with a projecting porch, on the application of W. J. Almond, on behalf of Dr. Parrott (*consent*).

Erection of two three-storey oriel windows upon the Brompton Square frontage of a building to be erected on the northern side of Brompton Road, Kensington, on the application of Worleys and Armstrong on behalf of J. J. Wheeler (*consent*).

Erection of a porch and two lean-to additions in front of the Holy Cross Catholic Church, Sangley Road, Catford, on the application of the Rev. E. Escarguel (*consent*).

Erection of eight buildings on the southern side of High Road, Lee, with projecting one-storey shops in front, on the application of Hatch and Hatch (*consent*).

Erection of an illuminated sign at the premises of Short's, Ltd., abutting upon the footway leading from the Strand to Aldwych, on the application of Buckley and Beach, on behalf of Short's, Ltd. (*consent*).

Erection of projecting bay windows to proposed houses, Nos. 1, 4, 6, 7, 8, and 10, Beechhill Road, Eltham, on the application of J. J. Bassett, on behalf of A. Cameron Corbett (*consent*).

Erection of a mission building on the western side of Wandsworth Bridge Road, Fulham, and also abutting upon the southern side of Hugon Road, on the application of Z. King and Son on behalf of R. W. Black (*refusal*).

Erection of one-storey projecting shops in front of Nos. 93 and 95, Southgate Street, Islington, on the application of Lovegrove and Papworth, on behalf of W. Hutton (*refusal*).

Erection of a covered way in front of 29, Upper Hamilton Terrace, St. John's Wood, on the application of Mark Liell and Son, on behalf of Northcote (*refusal*).

Erection of a motor garage building on the northern side of Church Walk, Hampstead, on the application of J. D. Hunter, on behalf of C. B. King (*consent*).

Erection of an addition to the rear of No. 131, West Ferry Road, Poplar, on the application of E. B. Ellis, on behalf of Padwick (*consent*).

Erection of a one-storey mission hall adjoining the Hoxton Hall, Wilks Place, Hoxton, on the application of Lovegrove and Papworth, on behalf of T. Godlee (*refusal*).

Erection of a building on the northern side of Brompton Road, Kensington, on the application of Worleys and Armstrong, on behalf of J. J. Wheeler (*consent*).

Erection and construction at the Stag Brewery, Pimlico, of an iron building, on the application of M. T. Saunders, on behalf of Watney, Combe, Reid and Co. (*consent*).

Erection of buildings on the southern side of Broughton Road, Fulham, on the application of Gordon Wilson and Co., on behalf of Loud and Western, Ltd. (*consent*).

Erection of a house on the western side and a house on the eastern side of Moundfield Road, Hackney, on the application of J. Ellwood, on behalf of S. H. Barclay (*consent*).

Erection of a conservatory over the porch in front of No. 13, Brechin Place, Kensington, on the application of J. Anderson, on behalf of Mrs. N. Harris (*refusal*).

Erection of a motor house at 43, Leyland Road, Lewisham, on the application of J. C. Thomas, on behalf of Rollaston (*refusal*).

Erection of a projecting one-storey addition in front of No. 9, New Bridge Street, City, on the application of A. F. Briggs, on behalf of R. C. Cleed (*consent*).

Erection of buildings on the eastern side of Mitcham Road, Wandsworth, on the application of C. T. Baker, on behalf of S. Sinclair (*consent*).

Erection of an iron and glass shelter at the proposed new restaurant entrance of the Berkeley Hotel, Piccadilly, on the application of Forsyth and Maule, on behalf of the directors of the Berkeley Hotel Co., Ltd (*consent*).

Erection of van sheds, stables, and a manager's house at Gasholder Place, and Upper Kennington Lane, Kennington, on the application of P. Dollar, on behalf of Birch Brothers (*consent*).

Uniting of Nos. 187 and 189, Roman Road, Bow, and erection of a two-storey addition at rear of No. 187, on the application of G. Elkington and Sons, on behalf of Mrs. Levy (*consent*).

Conversion of a stable into a dwelling-house at "Point House Club," The Grove, Blackheath, on the application of R. York (*consent*).

Re-erection of four dwelling-houses on low-lying land in Upper Grange Road, Bermondsey, on the application of T. Sloman (*consent*).

Extension of Borough Polytechnic Institute, on the application of Rowland Plumbe (*recommended*)

Alteration to Metropolitan Music Hall, Edgware Road, on the application of F. Matcham and Co. (*recommended*).

Roofing the fire yard in rear of the Empire Theatre of Varieties, Shepherd's Bush, so as to form a waiting-room (*recommended*).

New Companies.

W. G. Vowles, Ltd., to adopt an agreement with W. G. Vowles for the acquisition of the business of an organ builder carried on by him at St. James's Square, Bristol. Capital: £5,000.

Burgoines, Ltd., to carry on the business of painters, decorators, builders, contractors, etc., 32, Ramsden Street, Huddersfield. Capital, £1,000.

Surbiton Land Co., Ltd., to acquire and deal with freehold, copyhold, or leasehold property, to finance builders, and to carry on the business of builders, etc. 13, Victoria Road, Surbiton.

James Simpson and Sons (decorators, Hull), to acquire the business carried on under this title at 10, Storey Street, and 3, Castle Street, Hull. Capital, £2,000.

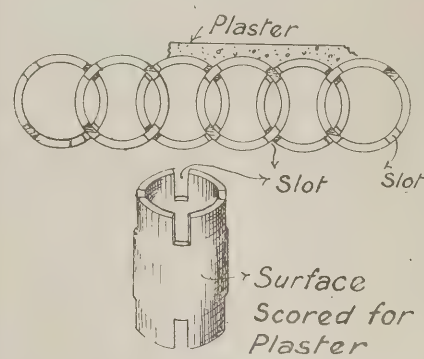
THE PORTLAND CEMENT TRADE.

Although, speaking generally, the demand for Portland cement continued slack throughout the month of February, some improvement has been noticed in the Home markets, and manufacturers are now looking forward to early activity. We have now probably got through the worst of the winter, and unless something abnormal happens, a substantial increase in demand is bound to assert itself within the next few weeks, and we may expect prices to go higher.

Having regard to the high cost of fuel, which the trade will have to pay during practically the whole of the calendar year, there can be little if any profit in manufacturing cement with prices at their present low level. The principal feature of interest which has occurred lately has been the circulation of tenders for the supply of 4,500,000 casks of cement to the Panama Commission. Doubtless this important contract will be keenly competed for, not only by American makers, but by manufacturers in this country and in Europe. Deliveries are to commence towards the end of this year, and the quantity will be taken within a period of three years. The placing of this, which is probably the largest single order for Portland cement ever contemplated, will exercise a strengthening influence in markets generally, irrespective of whether it is placed here, in America, or on the Continent. The continued decrease in the importation of Belgian cement into this country is a source of much satisfaction to all those who are concerned in the production or use of the genuine article. The importations for January at 5,265 tons are lower than they have been in any month for many years, and it looks as if the days of this inferior material in this country are numbered. On the other hand, the export figures are showing some reduction on last year, mainly owing to the practical cessation of demand from the Pacific Coast of America. There is still a great deal of work to be done in connection with the reconstruction of San Francisco, but it seems as if the local manufacturers to a large extent will be able to supply what is needed.

A TUBULAR BRICK.

Although there have been thousands of special bricks patented at one time and another, there probably have been few of such a novel type as the one shown below.



This is a tubular brick with slits at each end for bonding; appearing on plan as a series of overlapping rings, the slots of each brick being placed, as it were, into one another. The slots are made wide so that the wall can be curved on plan if required. The outer surface of each brick is scored for adhesion of plaster. This brick is the invention of Mr. Van Wie, of Kenosha, Wisconsin, U.S.A.

Proposed Extension of the Royal Exchange, Manchester.—For a long time past the Royal Exchange at Manchester has been excessively crowded on certain days of the week. A proposal is now on foot for extending the building by acquiring Bank Street and a portion of Half Moon Street. The cost of the scheme is estimated at £500,000.

* * *

Quebec Bridge Disaster.—The report of the Royal Commission on the Quebec bridge disaster will be presented to the Dominion Parliament this week. The report finds that the collapse was not due to any defect in the material or construction, but to a fundamental defect in design. The chief engineer of the Phœnix Bridge Co. was primarily responsible for the design, but it was approved by Mr. Theodore Cooper for the Quebec Bridge Co., and was accepted by the Government.

* * *

The Scottish College of Architecture.—This college has been founded by Mr. D. Bennet Dobson, I.A., with the object of providing educational facilities for young men desirous of qualifying for examinations of outside educational bodies whose certificates are considered necessary in the obtaining of good building appointments. Commodious and central premises have been provided at 108, Douglas Street, Blythswood Square, Glasgow, where evening courses in building construction, masonry and brickwork, carpentry and joinery, manual work, and sanitary science, are given at very moderate fees.

RETAINING WALLS IN THEORY AND PRACTICE.

By T. E. COLEMAN.

(*Continued from p. 125, No. 678*).

When earth is heaped into embankments it forms a certain natural slope, which varies according to the nature of the material or frictional resistance of the earth particles upon each other. The angle formed between the horizontal and the natural slope taken by any particular material is known as the "limiting angle of resistance," or "angle of repose" for that material. The following table shows the average natural slope, or angle of repose, for different materials, viz.:—

Natural Slope of Earths, etc.

	Angle with horizontal.	Ratio of base of slope to height.
Sand, fine, dry	32°	1·6 to 1
,, wet	26°	2 to 1
Earth, ordinary	30°	1·7 to 1
,, consolidated, dry	45°	1 to 1
Clay, wet, recently excavated	15°	3·7 to 1
Clay, dry, well drained	26°	2 to 1
Gravel, compact	40°	1·2 to 1
,, with sand	32°	1·6 to 1
Shingle, loose	36°	1·4 to 1
Rubble stone	45°	1 to 1
Peat, wet	14°	4 to 1
,, dry	45°	1 to 1

When a retaining wall is required for ordinary building purposes, its thickness may be determined by one of the many well-known labour-saving formulas in general use. The necessity to enter into a series of more or less elaborate calculations is thus avoided. In the case of important structures it is, however, necessary to enter into detailed and careful calculations to ascertain the proper thickness of wall required so as to combine the maximum economy in construction with the necessary safety.

As the result of a large and varied experience, Sir Benjamin Baker found that for average earth backing and foundations, the thickness of a retaining wall need not exceed one-third the height of the wall, measured from the top of the footings. The same authority states that "a wall one-quarter of its height in thickness, and batter 1 in, or 2 ins. per foot on the face, possesses sufficient stability, when the backing and foundation are both favourable," and that "under no conditions of surcharge or heavy backing is it necessary to make a retaining wall on a solid foundation more than double, or one-half of the height in thickness."

The Building laws of New York require that all building owners making an excavation on any site must erect a retaining wall to the full height of the earth to be supported, and the thickness of the retaining wall at its base must in no case be less than one-fourth its height.

Molesworth gives the following rules as having been largely adopted for perpendicular retaining walls on railway works:—

I. For vertical walls of uniform thickness, the thickness of wall $= \frac{h}{4}$. II. For vertical walls with two offsets at back, the lower part of wall $= \frac{h}{3}$; the centre portion $= \frac{h}{4}$; and the upper portion $\frac{h}{8}$. Figs. 18 and 19 are typical sections as found by the foregoing rules.

Where greater accuracy is required, Hurst's formula may sometimes be conveniently adopted, as it provides a separate co-efficient for different descriptions of earth-work. For retaining walls with vertical sides, and backing horizontal at top (Fig. 20) the formula is as follows, viz.:—

$$t_1 = \cdot 7\, h \tan \frac{\varepsilon}{2} \sqrt{\frac{w}{W}}$$

where

t_1 = mean thickness of wall in feet.
h = height of wall in feet.
w = weight in lbs. of a cubic foot of earth at back of wall.
W = weight in lbs. of a cubic foot of wall.
ε = angle which the natural slope of the earth makes with the *vertical*, as follows:—

	ε	$\tan \frac{\varepsilon}{2}$
Vegetable earth or clay in its natural state, consolidated and dry	45°	·414
Loamy ditto ditto	50°	·466
Gravel and sand, moist	52°	·488
Shingle or gravel without sand	54°	·510
Excavated earth, wet	56°	·532
Fine dry sand	58°	·554
London clay in its natural state, but saturated with water	65°	·637
Ditto, recently excavated, and ditto	75°	·767
Water	90°	1·000

For *sloping* walls, the following modification for the value of t_1 in the foregoing formula is given:—

t_1 = 1·00 for wall with vertical sides.
= ·86 for sloping wall with external batter of 1 in 12.
= ·80 for sloping wall with external batter of 1 in 8.
= ·74 for sloping wall with external batter of 1 in 6.
= ·72 for sloping wall with external batter of 1 in 5.
= ·85 for wall with internal offsets and vertical face, but with $\frac{1}{7}$th less material than the vertical wall.

In the case of *surcharged* retaining walls, the following alteration is made in the formula so as to adapt it to the altered conditions, viz.:—"Substitute for h in the formula the vertical height h^1 measured to the point F, found by setting off the distance D = h along the slope of the bank" (see Fig. 21). It should be noted that the results thus obtained, although not strictly accurate, are sufficiently near for practical purposes.

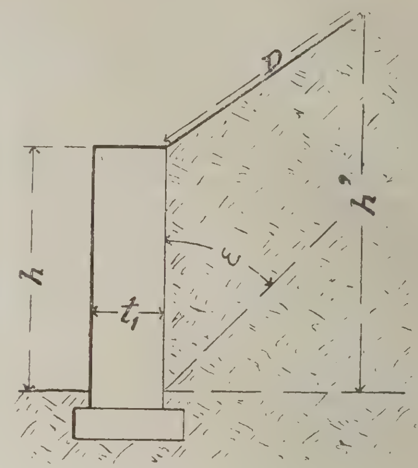


FIG. 21.

When constructing ordinary retaining walls for water—as for tanks, reservoirs, &c.—having no great depth, a good and sound general guide is to provide a base thickness of $\frac{3}{4}$ths the height, and a top thickness of $\frac{1}{3}$rd the height of the wall. Another rough and ready means of determining the approximate section is to adopt the well-known rule of making the wall a thickness at the base of $\frac{7}{10}$ths the height (·7h.), and at the top $\frac{3}{10}$ths the height. Figs. 22 to 25 are four typical sections as found by this latter rule, showing how the general arrangement may be varied to suit any specific conditions. In Fig. 22 the back of the wall is vertical, the front face being battered so as to reduce the dimensions of the wall to the required thickness at the top. Fig. 23 is shown with a batter of 1 in 10 at the back and 3 in 10 at the front, whilst Fig. 24 is a section having an equal batter at front and back. In Fig. 25 a batter of 1 in 10 is provided at the front face, with 3 in 10 at the back. The same cubic quantity of materials is required for each of the four types shown, but the sections indicated in Figs. 22 and 23 provide the greatest ratio of stability.

The Theory of Stability.

The general stability of any structure can only be maintained so long as the forces acting upon it are in equilibrium. In the case of retaining walls these forces usually are:—

1. The weight of the wall (or force of gravity) acting downwards.
2. The thrust of the earth or water acting in a sloping or horizontal direction.
3. The upward or supporting pressure of the foundation.

It is essential that these three forces shall mutually balance or counteract each other, and any failure to do so arises either from excess of thrust of the earth or water, or from weakness in the supporting power of the foundation itself.

When designing retaining walls it becomes important to consider how far the nature of the materials employed may influence the actual conditions necessary for s[illegible]le stability,

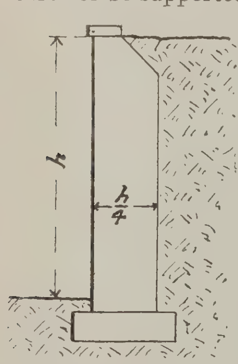


FIG. 18.

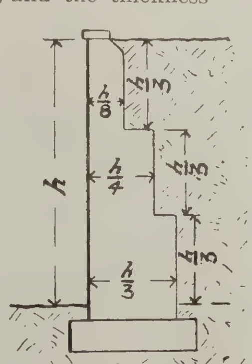


FIG. 19.

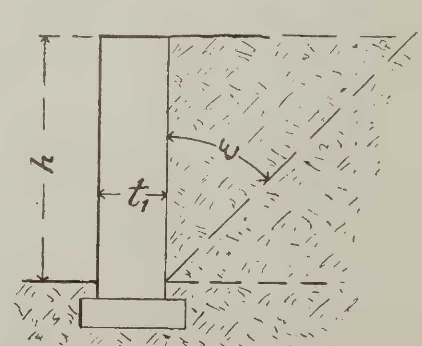


FIG. 20.

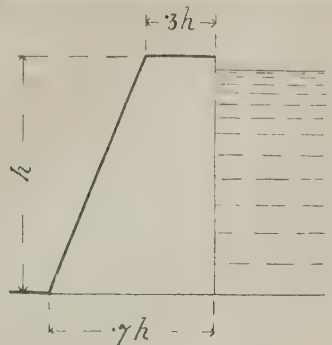


FIG. 22.

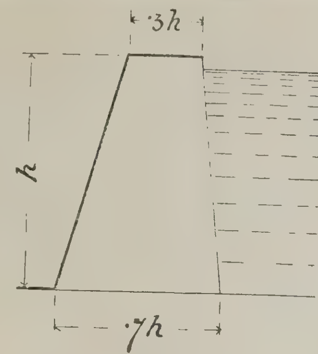


FIG. 23.

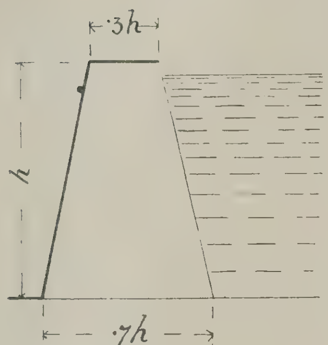


FIG. 24.

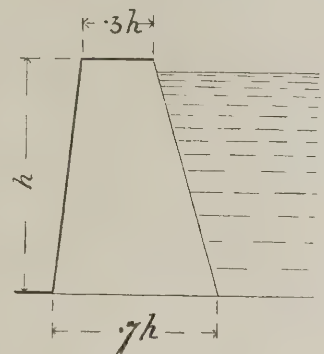


FIG. 25.

Under ordinary circumstances retaining walls are built with concrete *in situ*, or of brickwork, masonry, or concrete blocks put together with mortar, so that the ultimate strength of the structure to resist overturning at any bed-joint is dependent on the weight of the wall, and the adhesive power of the mortar used in bedding or cementing the blocks or aggregate. The tenacity of mortar, however, varies within such wide limits (so much being dependent on the quality of materials and skill employed in making the mortar and jointing the blocks, &c.) that it is in every way desirable not to take into consideration any adhesive strength the mortar may possess.

For enclosure walls and other similar structures, the cementing power of the mortar may be taken into consideration, but for all engineering works necessitating retaining walls for reservoirs, earthworks, etc., it is usual to disregard the adhesive power of mortar rather than incur any risk of failure, with its possible disastrous results on life and property. For these reasons, the stability of an ordinary retaining wall is calculated as that of a structure of uncemented blocks, which is entirely dependent upon its weight and general design, as opposed to any external forces which may be brought against it.

Assuming that a good foundation is available, we find that gravity retaining walls may fail in either of the following ways, viz. :—

1. By instability of position, or overturning at the edge of a bed joint or horizontal section.
2. By crushing of the material at the face of the wall.
3. By instability of friction, or sliding along a bed joint or horizontal section.

All well-designed retaining walls must therefore be so arranged and constructed that they shall successfully withstand these adverse conditions at each bed joint.

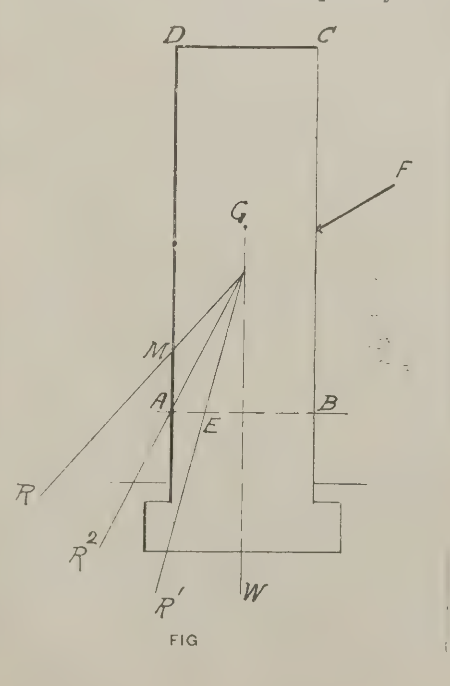
Within recent years it has been suggested that a masonry dam or retaining wall may fail by sheering along a vertical section, in addition to failure by overturning, crushing, or sliding along a horizontal plane. This theory formed the subject of a paper published by Messrs. Atcherley and Pearson, "On some disregarded points in the Stability of Masonry Dams," wherein it is considered that the vertical sections of a dam, when under water pressure, are subjected to greater stresses than the horizontal sections. As a result, it is contended that a masonry dam which has been designed to resist failure from overturning, crushing, or sliding on a horizontal section, may yet fail by cracking or shearing on a vertical section. Whilst this theory may be true under certain assumed conditions, yet it has not yet been proved that such conditions would be found in any well-designed and constructed masonry dam complying with existing accepted principles and details of practice.

In the construction of important masonry dams, it is insisted upon by experienced engineers that the masonry shall be carried down and directly connected to a solid rock foundation. Also under no circumstances shall any continuous vertical joints be permitted within the thickness or length of the masonry walls. Further, as an additional security against failure, it is also a recognized practice that continuous horizontal joints shall not be allowed. Where systematic bonding of this description is provided, the entire wall approximates to a monolith which has been designed with such a large provision for security that the factor of safety ordinarily employed is considerably in excess of any incidental stresses such as the possible shearing in a vertical plane, and which might arise from conditions which at present are indeterminate for structures of this character.

Failure by Overturning and Crushing.

Failure by overturning is probably the most common defect met with in an ordinary retaining wall, and is usually due to the wall having insufficient thickness or mass to counteract the external force acting upon it. Fig. 26 represents the section of a vertical retaining wall of uniform thickness ; A B being one of the bed joints, and F the external force. The weight (W) of the portion of wall above the bed-joint is also indicated, acting vertically downwards through the centre of gravity (G) of the wall. Assuming that the adhesive power of the mortar is not taken into consideration, then, if the resultant force or pressure (R) of the two forces F and W falls outside the bed-joint as at M, the wall will overturn. If, on the other hand, the resultant pressure (R_1) falls within the bed-joint, as at E, then the wall is stable, so far as any danger of simple overturning is concerned. The point at which the resultant pressure intersects any bed-joint is known as the "*centre of pressure*" or "centre of resistance" for that bed-joint. When the centres of pressure for a series of bed-joints in a retaining wall are joined together, as at A B C D E (Fig. 27) the line thus obtained is known as the "*line of pressures*," or "line of resistance." If it be theoretically assumed that the bed-joints are infinitely close to each other, then the line of pressures becomes a curve, known as the "curve of resistance" or "curve of pressures."

Referring again to Fig. 26, it will be seen that the nearer the resultant pressure R approaches the outer edge of the bed-joint A B, then so much the greater



FIG

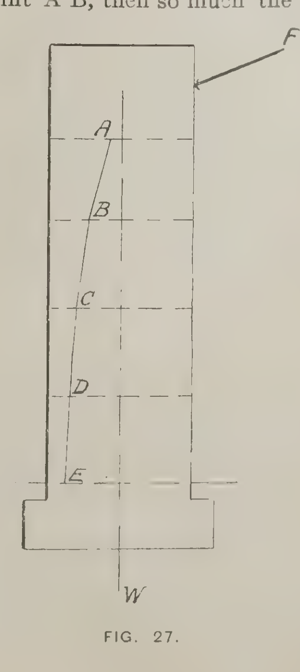


FIG. 27.

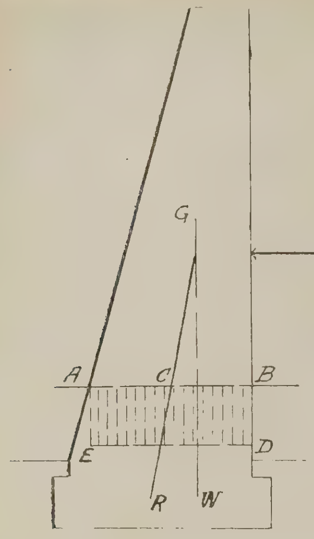


FIG. 27.

will be the intensity of pressure upon the outer portion of the bed-joint. When the resultant pressure R^2 passes through the outer edge of the bed joint, then the minimum condition of statical stability has been reached, for the block A B C D is in a state of unstable equilibrium, it being on the point of overturning with the slightest additional pressure. Under these circumstances, it is also obvious that with a retaining wall of great weight, and a sufficient force F acting against it, the materials of which the wall is built would be crushed at the outer edge of the bed-joint—when the resultant pressure at that point exceeds the crushing strength of the materials—and failure by crushing would ensue.

It is therefore essential for absolute safety that the materials of which a retaining wall is built shall not be subject to any excessive or concentrated crushing force, and under no circumstances should any bed-joint be subject to a tensile stress. To obtain this result, the walls must be so designed that the resultant pressure shall intersect the central portion of each bed-joint within certain limits, so as to prevent any excessive inequality of pressure being borne by any part of the wall. The most favourable condition is obtained when the resultant pressure intersects the exact centre of the bed-joint as at C in Fig. 28. The weight of the wall (W) is shown acting directly downwards through its centre of gravity, F being the external force. The resultant pressure (R) intersects the bed-joint at C, this point being the centre of pressure and also the centre of the bed-joint, so that an equal distribution of the total normal pressure (N) on the bed-joint is obtained, as indicated diagramatically at A B D E. Let the width of the wall A B = t, then the mean intensity of pressure when spread uniformly over the thickness of the wall (t) = $\frac{N}{t}$.

(To be continued.)

SAFE LOADS.

In the course of a paper on "Foundations" which he read before the Institute of Sanitary Engineers on February 5th, Mr. Percival M. Fraser, A.R.I.B.A., gave the following table of safe loads in tons per sq. ft.:—

Brickwork in cement, 10 tons; brickwork in lias lime, 5 tons; brickwork in grey lime, $2\frac{1}{2}$ tons; Portland cement concrete, 1 to 6, 15 to 20 tons; lime concrete, 1 to 6, 2 to 4 tons; marsh, quicksand, or silt, 2 to 3 cwts.; peat turf, $1\frac{1}{2}$ cwts.; wet clay, $1\frac{1}{2}$ cwts.; loams of clay and sand and damp clay, 15 cwts.; mixed clays, 2 to 3 tons; sand with no lateral means of escape, $3\frac{1}{2}$ to 5 tons; good clay yellow, or blue and marl, 4 to 8 tons; chalk, 1 to 4 tons; ordinary sand, dry, $2\frac{1}{2}$ to 5 tons; hard pan, 6 to 7 tons; good gravel, 7 to 10 tons; rock, 8 to 20 tons.

Mr. Fraser said the usual factor of safety was 5 to 10. As regards the strength of clay, at 20ft. deep it was found to bear 2 to $3\frac{1}{2}$ tons per ft. super. under the Eiffel Tower, and at 70ft. deep under the Forth Bridge it carried 6 tons per ft. super. As regards the strength of brickwork, he said that ordinary good brickwork should never fail from crushing, as the height of a brickwork column sufficient to crush the material at the base would have to be 600ft. to 900ft.

YORKSHIRE FEDERATION OF BUILDING TRADE EMPLOYERS.

The monthly meeting of the Executive Council of the Yorkshire Federation of Building Trade Employers was held at Bradford on Tuesday, February 20th. Mr. J. Biggin (president) occupied the chair, and was supported by thirty-two delegates from local associations. After certain formal business had been transacted, the president reported that the National Administrative Committee had considered the Report of the Departmental Committee appointed to enquire into the dangers attendant upon building operations. The committee had resolved that a letter be sent to the Home Secretary on behalf of the National Federation, and that a copy of the same be sent to each Federation and local association with a request for support. A draft letter to the Home Secretary, on behalf of the Yorkshire Federation, was read and considered. On the motion of Mr. T. Lindley, seconded by Mr. E. A. Elvey, the letter submitted by the Emergency Committee was approved; and it was also decided to urge the Northern Centre to request the Home Secretary to receive a deputation to lay before him the custom and practice in the North with respect to scaffoldings, etc., and reasons why many of the suggested regulations would be unnecessarily restrictive and arbitrary. Mr. P. Rhodes moved, and Councillor W. G. England, J.P., seconded, a motion, which was duly carried, that each Local Association be requested to take the Report of the Departmental Committee into careful consideration within the next month, and send a letter to the Home Secretary, similar in principle though varying in expression, to those sent by the National and Yorkshire Federations; and that it be a recommendation that the letters be sent through the Federation secretary.

The president reported that the Sweated Industries Bill, which sought to establish boards with authority to fix a minimum wage in certain industries, had received the consideration of the National Administrative Committee. A motion of Mr. P. Rhodes, seconded by Councillor W. G. England, J.P., was carried requesting the Employers' Parliamentary Council to urge that a clause be inserted in the Bill making it inoperative to trades between whose accredited representatives of both employers and employees agreements have been come to with respect to rates of wages and conditions of labour.

The report of the Employers' Parliamentary Council on Bills in Parliament was read and considered.

It was reported that the Home Secretary had been informed of the Federation scheme for insurance, and had been asked to kindly authorise the Federation to furnish a collective return under section 12 of the Workmen's Compensation Act, 1906, on behalf of the employers insured or represented by them.

The minutes of the Lancashire, Cheshire, and North Wales Federation, the Northern Counties Federation, and the Midland Centre were read and considered.

The Hull Association reported that a counter notice had been received from the bricklayers, plasterers, joiners, masons, and labourers for an advance of $\frac{1}{2}$d. per hour in wages, and during the summer season the working hours to be 50 hours per week for 38 weeks.

A notice was read from the York Association stating that notice had been given to the Joiners' Society to strike out the 10 miles radius and to substitute a 4 miles radius, so as to be uniform with the other trade rules. On the motion of Mr. A. J. Forsdike, seconded by Mr. A. Moulson, the Federation cordially approved of the action of the York Association.

Mr. Raper, vice-president of the Bradford Association, reported that they had arrived at a mutual understanding with the operatives as to the area in which the working and conciliation rules should apply.

Mr. J. S. Myers reported that the Leeds Association and other kindred associations had not been successful in their efforts to abolish the Corporation Works Department. The members in support of the abolition had been successful in the various committees, however, in having Corporation work thrown open to competition, and in private tenders being accepted.

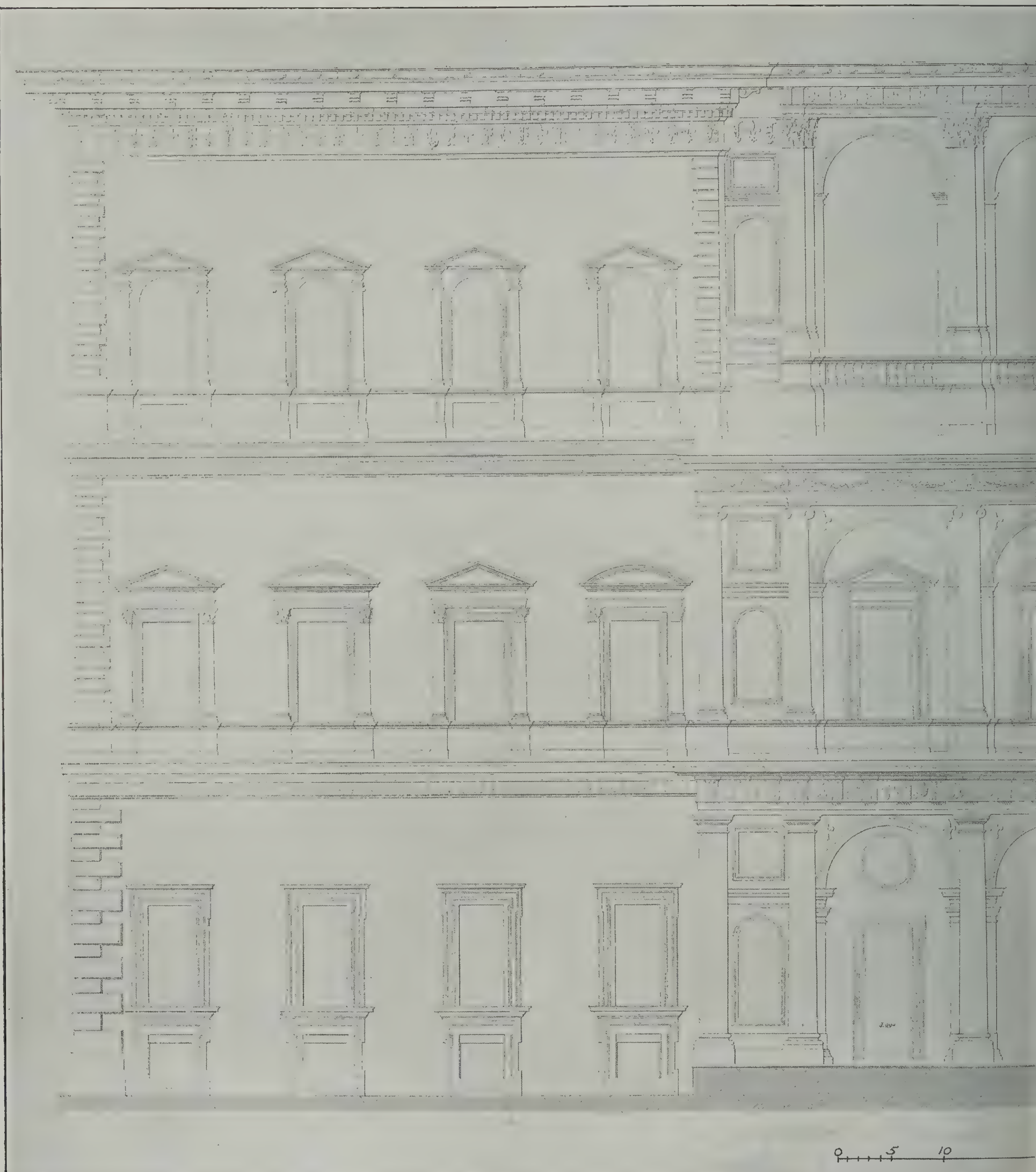
Mr. Bottomley, president of the Huddersfield Association, invited the Federation to hold the March meeting in that town, and on the motion of Mr. T. Lindley, seconded by Mr. W. R. Thompson, the invitation was cordially accepted, and the meeting arranged for Thursday, March 19th.

THE BUILDING TRADE AND THE COAL MINES (EIGHT HOURS' BILL.

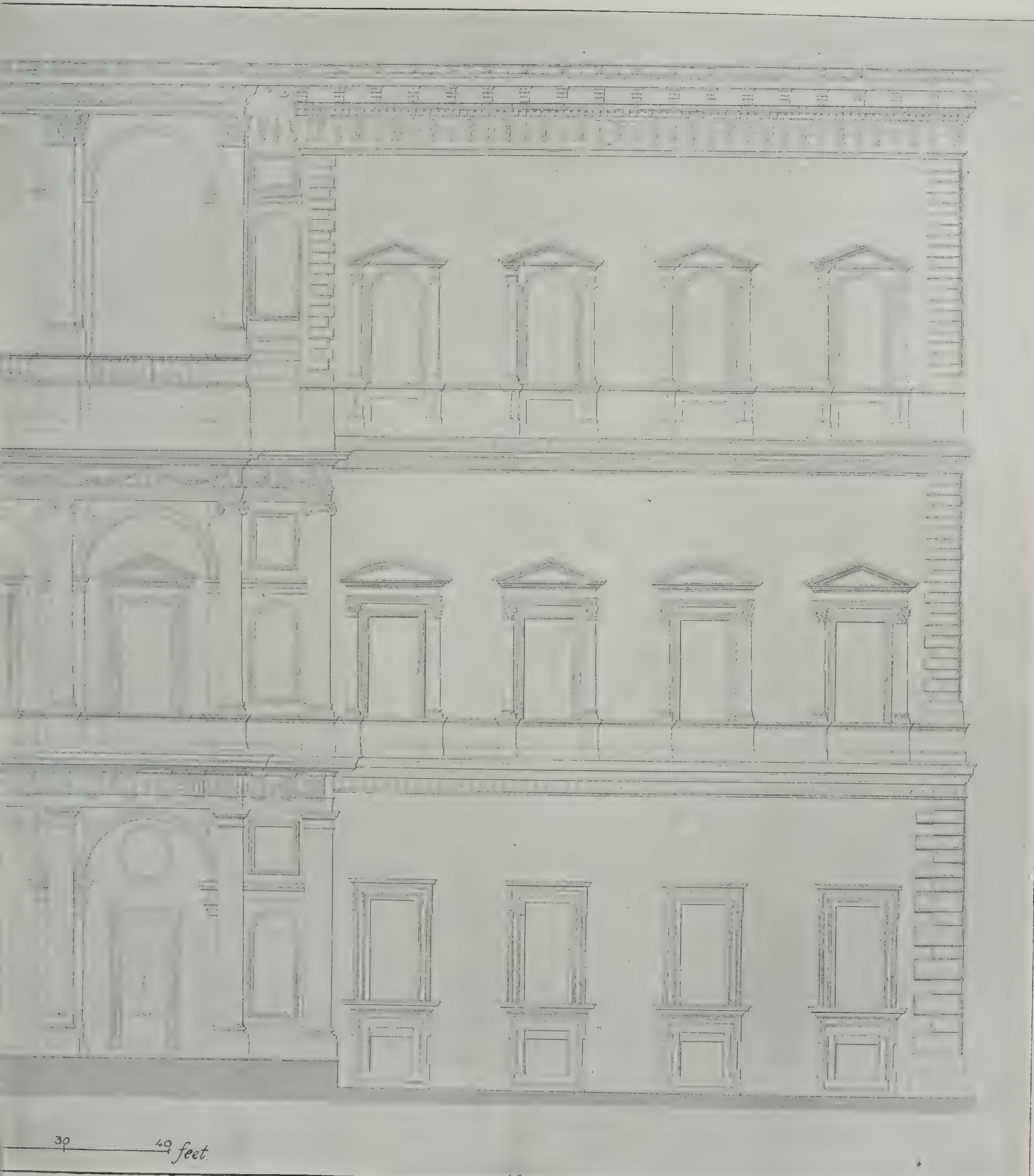
The Government have promised to pass a Bill for miners this session which shall limit the hours of work for all workers employed below ground to eight hours from bank to bank. The measure is viewed with much alarm by the railways, iron trades, shipping and other great coal consuming industries of the country, and these and other bodies are taking steps to bring before the Government the serious consequences which will result if such a measure becomes law; and they are further endeavouring, by public meetings, and other means, to arouse the attention of the public generally to the fact (which it does not seem as yet to have grasped) that the effect of the measure will be to raise the price of coal for all consumers to a very serious extent—perhaps, from 2s. to 3s. per ton.

The building trade, although not a great coal-consuming industry in the ordinary sense, cannot afford to remain indifferent. The matter should be taken up by the National Federation of Building Trade Employers, and by its local branches throughout the Kingdom, who should urge every member of their organisation to use his influence with Members of Parliament, local authorities, chambers of commerce, and every householder with whom he comes into contact, so as to induce them to join in one great national protest against this attempt to penalise the whole community for the personal advantage of the miners.

The second reading of the Bill is fixed for Friday, June 5th.



THE FARNESE PALA



ME: REAR ELEVATION.

March 11, 1908. Volume 27, No. 683.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.
Telegraphic Address: "Buildable, London."
Telephone: 364, Westminster.
The "Fire-Resisting Construction Section" is given in this Issue.
The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

The Jury System of Assessing Competitions. The arguments brought forward by Mr. H. W. Wills at the last meeting of the Royal Institute of British Architects, in favour of the jury method of assessing competitive designs, were perfectly sound, logical, and convincing. But, as was pointed out by one of the subsequent speakers, having regard to the utter breakdown of the system in the case of the competition for the Peace Palace at the Hague, and, still more recently, in that of the London County Hall, it is impossible for competing architects to take an altogether optimistic view of the probable effect of the proposed change. Indeed, we doubt whether, in the County Hall competition, any of the three assessors, if acting *singly*, would have had the temerity to incur the responsibility of making an award of the nature of that emanating from the jury concerned in this last miscarriage of justice. Speaking generally, we think that Mr. Wills touched the weak spot in expressing the opinion that the cause of many bad awards is due to the fact that definite conditions, which are scheduled as binding on the competitors, are often disregarded by an assessor. There is another reason, however, to which we have more than once drawn attention, namely, that arising from the imperfect architectural knowledge of the assessor; and until architects are better educated in the technique of their profession, and are therefore able to discriminate between what is good (and permanent) in architecture, and what is bad (and ephemeral), competitions are not likely to result, whether conducted under the auspices of a single assessor or under the jury system, in the selection of satisfactory designs. Mr. Wills favours what he describes as "the real jury system," which has been long since adopted in France and America. In this the decision is left to three or more assessors, each of whom has an equal vote, and *prima facie* it would appear that this method of adjudication would be equally suitable for this country. It must be borne in mind, however, that, owing to the definite nature of their early training, French and American architects are far in advance of their comparatively untrained English brethren in the appreciation and recognition of the fundamental requisites of monumental work, and we do not feel at all certain that the combined knowledge of three or more imperfectly educated men is likely to produce a better result than is customary under the individual responsibility of a single assessor. One of the many other suggestions made by the mover of the resolutions appears to us to be in every way worthy of careful consideration. It was to the effect that in each year a list of assessors experienced in various types of buildings should be drawn up (and submitted for the approval of the general body of the Institute), and from the list so prepared and approved a selection should be made by the president when called upon to nominate an assessor. As Mr. Wills pointed out, the general concensus of opinion would indicate the changes that would have to be made, from time to time, in the composition of the list, and he concluded his speech with the very practical proposal that a special committee should be formed to investigate all *legitimate* complaints with regard to architectural competitions. This committee would not be appointed with the idea of seeking the reversal of any award already made, but as a means of using past experience to avoid repetitions of similar mistakes. On the whole, we are in favour of the general principle involved in the proposed change in the method of conducting competitions, and we congratulate the mover of the resolutions upon the very moderate, fair, and unprejudiced manner in which his views were expounded to an interested and sympathetic audience.

The Architectural Profession Viewed from Without. In a speech delivered during the recent discussion in the Senate on the report of the Diploma in Architecture Syndicate, Professor Ridgeway, one of the supporters of the movement to found a School of Architecture at Cambridge, made some trenchant but thoroughly justified remarks on architects and the state of the architectural profession. Whilst admitting the fact that architects had been trying, for the past 60 years, to unite and do something towards reforming their profession, Professor Ridgeway said that they were still in a chaotic condition. With regard to Mr. Blomfield's statement that there is no such thing as a "science of architecture," the speaker stated that a great many members of the community had realised that fact for some time past. He proceeded to explain that he alluded to those "who had had experience of smoky chimneys and discomforts of that sort," and it had occurred to some of the sufferers that the sooner Cambridge tried to put things on a scientific basis the better. Although architects had done very little for themselves, they had, at last, drawn up a scheme of their own, but it was not of a very high order, and some architects did not like the idea of their own diploma at all. As to the statement made by Mr. Blomfield and his colleagues that "architecture is a fine art; you can no more teach men architecture than you can teach them painting and sculpture," Professor Ridgeway remarked that it sounded

very well, but, in his view, architecture, unlike painting and sculpture, was not purely a luxury. Humanity had managed to live without painting or sculpture, but humanity had not been able to live without houses. It was therefore necessary to rectify the present condition of things, under which any man could hire a room and put up a brass plate declaring that he was an architect. Such a man could practise without hindrance, and the poor deluded public went to him and had to suffer for it. "But the great architects in London would do nothing to remedy it. They said they did not want a diploma, that each man must establish his own position. It was all very well for these great men to assume that attitude, but what was wanted was something to prevent the public from being gulled, and, what was more, they required something that should raise the level of architects throughout the land." We venture to think that the trend of thought indicated by the above remarks of a very distinguished man coincides with the ideas and utterances of many architects who have been endeavouring for years past to bring about some much-needed measures of reform in the architectural profession. It has been well said that, in any profession, the measure of the status of its average member is the measure of the status of the whole, and were it not for the absolutely selfish policy pursued by some of the—so-called—leading architects of the day, the large majority of members of the architectural profession who desire to see its doors closed to illiterate and incompetent persons would not now be looking to the University of Cambridge to formulate a scheme of architectural education which ought, long ago, to have been taken in hand by architects themselves. However, on behalf of that majority, we can assure the promoters of the proposed School of Architecture at Cambridge of our great appreciation and cordial approval of their efforts to institute, for the benefit of the public, a system of education which, under more fortunate conditions, would have been founded and fostered by architects primarily for the benefit of their art.

The Ironmongers' Almshouses.

We are glad to be able to record that the Charity Commissioners have decided not to sanction the proposed sale and demolition of the eighteenth-century almshouses of the Ironmongers' Company, which are situate on the Kingsland Road, London, N.E.—a most interesting group of buildings in a district of utterly sordid character. Readers will recollect that the Peabody Trust proposed to acquire the site for the purpose of erecting new buildings thereon. The scheme was opposed by numerous societies interested in the preservation of ancient buildings, and the Commissioners have now arrived at the conclusion that the almshouses should be preserved. There are some pessimists who always aver that it is futile in the present age to attempt to do anything for the preservation of ancient buildings when it is a question of large sums of money being offered for the sites they occupy. But this case of the Ironmongers' Almshouses is a hopeful illustration of the fact that, even if the efforts made to preserve old work are very often fruitless, they sometimes do succeed, and this success, though small, is worth the trouble taken.

The Liability of Surveyors for Reports.

A point of much interest to architects and surveyors was raised in the case of *Palmer v. Godwin, Basley and Co.*, tried in the King's Bench Division, before Mr. Justice Darling and a special jury on March 2nd and 3rd. The plaintiff had instructed the defendants, a firm of surveyors and valuers, to value a number of shops and flats in Seven Sisters Road, Holloway, stating that she should depend upon their valuation in deciding whether she could safely advance £5,500 upon the property. The defendants sent in a very glowing report, and recommended the advance, which was made in 1904. The interest fell into arrear, and the mortgagee eventually foreclosed. In 1907, other valuers having been called in, the premises were found to be in a most deplorable state, being pronounced by them not to be capable of repair, but practically needing reconstruction. The plaintiff based her claim upon an allegation that the defendants had made their report without exercising proper skill and care. It was suggested that the representative who was sent to look over the premises had not had sufficient experience, and did not check the statements made to him about the premises by the borrower, who was the builder. The law requires that every professional man should possess reasonable skill in his profession, and regards him as warranting the possession of such skill; also that he should exercise reasonable care. What "reasonable" is cannot be exactly defined, but it may be said to describe that degree of skill and care which an ordinary fair man would judge to be reasonable. In this case certain errors of fact were proved also to exist in the report. The roofs were stated therein to be concrete, whereas, in fact, only two out of the twenty houses had such roofs (the surveyor having examined these two only, under the direction of the borrower and builder). The remainder were covered with tarred felt. The floors were stated to be of tesselated paving, but were in fact of rough Staffordshire flagging. The plaintiff further contended that the backs of the houses (except two) had not been properly pointed, and her witnesses testified to various other faults in the construction of the premises. The defendants argued that the deplorable state of the premises was due to want of repair, and that no loss incurred by the plaintiff was attributable to want of skill or care on defendants' part, except what was attributable to the mistake about the roofs, if, indeed, that was negligent. In his summing up the judge remarked that the defendants were bound to show all due and proper care and caution, having had express notice that the plaintiff relied on them to say whether or not the property was proper and ample security for the loan. It was clear that the builder had not acted honestly in the matter. The jury awarded the plaintiff £1,750 damages, which should prove a warning to surveyors not to make reports on cursory examinations.

Ancient Lights.

The judgment delivered in the House of Lords in the recent case of *Cowper and others v. Milburn and others* involved a question of ancient lights which has been before the courts for nearly four years. In his review of the proceedings, Lord Macnaghten, who gave judgment, stated that the house in respect of which the ancient lights were claimed was 42ft. in height, and that the opposite building was originally of the same height. The latter building was subsequently raised to double this height, and it was alleged that this prejudicially affected the lights of all the floors in the plaintiff's house, although the claim was subsequently abandoned in respect of the attic and second-floor windows. Alterations that were afterwards made diminished the area of the ancient lights, as wood panelling was, in some cases, substituted for the original glass. It was contended on behalf of the plaintiffs, that the alterations to the windows did not involve the abandonment of any of their ancient lights, and that they were entitled, if they pleased, to restore the former state of affairs and reassert their rights. His Lordship held that the alterations did involve abandonment of so much of the ancient lights as was represented by the glass which had been replaced by the wood panelling. The Court of First Instance and the Court of Appeal came to the same conclusion on the case, and he was of opinion that the appeal should therefore be dismissed with costs. The judgment in this case should be carefully noted by architects who are interested in claims made in respect of ancient lights.

The Man with the Hammer.

At last week's opening of the Building Trades' Exhibition at St. James's Hall, Manchester, there was the usual hammering going on, which caused Sir William Bailey (who presided) to observe that the audience's chance of hearing his own and the Lord Mayor's remarks were exceedingly remote; the occasion, however, called to his mind the story of a Scottish hawker who was in the habit of mending his barrow on the Sunday. His wife, a strict Sabbatarian, remonstrated with him many times, but without avail, so at last she insisted: "Alexander, if ye must break the Sabbath, use screws." The story had its effect.

THE FARNESE PALACE, ROME: FRONT ELEVATION.

THE FARNESE PALACE, ROME.

This magnificent building, generally regarded as one of the finest palaces in Rome, was erected for Cardinal Alexander Farnese, who was later to become better known as Pope Paul III. Designed and partially constructed by the well-known architect Antonio da San Gallo (1470-1546), who did not live to see the completion of his labours, the palace, which is said to have been built with materials removed from the Colosseum and the Theatre of Marcellus, was finished under the superintendence of Michael Angelo, who took charge of the work immediatly after the death of San Gallo. The central feature of the back elevation, looking towards the River Tiber, is a later addition, made in 1580, by Giacomo della Potta. Although it is extremely difficult to say where San Gallo's work ended and Michael Angelo's commenced, yet most authorities agree that the latter architect added the top storey, including the well-known and justly admired main cornice, while the arcades of the cortile, which were commenced and carried to the level of the first floor by San Gallo, are also said to have been completed by his successor.

To what extent the building, as originally designed by San Gallo, was altered or remodelled by Michael Angelo, will now never be known, but the palace possesses most of the architectural characteristics to be found in the best of the many palatial buildings with which it is contemporaneous.

During the middle of the sixteenth century the architects of the Italian Renaissance obtained their artistic effects by apparently very simple means. Long, lofty, and unbroken facades, crowned by boldly-projecting cornices, square-headed windows (circular-headed openings being usually confined to arcades and doorways), rusticated angles and lower storeys were alike typical of the designs of Baldassare Peruzzi, Vignola, Raphael, and San Gallo. The last-named architect's work at the Farnese Palace is certainly of a very high order of merit; the triple entrance arcade, which is said to have served Sir William Chambers as a model for the Strand entrance of Somerset House, and the two fine halls of the inner court, being specially noticeable.

The design of the external structure, which has a frontage of about 192 ft., a depth of 260 ft., and a height of nearly 100 ft., is almost unequalled in the grandeur of its extreme simplicity, and notwithstanding the fact that, at any rate, its upper part was not carried out in accordance with the original drawings, the three storeys, forming the component parts of the building, constitute a singularly impressive, dignified, and harmonious effort of monumental architecture. On the ground floor the range of square-headed windows is broken only by a rusticated entrance archway, surmounted by a balustraded balcony, behind which the central first-floor windows are simply but effectively grouped. The unusually large amount of horizontal blank wall space between the windows of the various storeys is embellished, above the central windows of the first floor, with three well-designed shields or cartouches in pleasing contrast with the mass of plain walling in which they occur.

The garden front, left unfinished by Michael Angelo, was afterwards taken in hand by Giacomo della Potta, who added the central feature, consisting of a recessed Doric portico (ceiled with cross vaulting), the architectural lines of which are continued through the first and second floors by the aid of engaged columns of the Ionic and Corinthian orders. In the design of this central feature, except in the case of the top loggia, where the proportion has been lost, the beautiful arcading of the inner courtyard is repeated externally with disastrous effect to the appearance of the back facade. It is true that an attempt has been made to make the cornice of each pseudo-loggia range with the deep stringcourse placed under the windows of the upper floors, but the result of the addition is most incongruous, and the *motif* of the design, namely, a flat cornicione building, of which the main walls receive no extraneous relief from columns or pilasters, has been utterly lost by the treatment of this portion of the building. To crown all, the continuity of the heavy main entablature has been broken in the centre of the facade, in order to obtain increased height for the cornice above the loggia of the second floor. In fact, this unfortunate addition to what was originally a fine work of art, is thoroughly in accord with the unscholarly tendencies of the men of the later period of the Italian Renaissance, when architectural

design was in its worst and most decadent phase.

The inner courtyard of the palace, forming on plan a square whose sides are about 90 ft. in length, is surrounded by magnificent arcades, three storeys in height, partially filled in with windows. In it are two ancient sarcophagi, one of which is that of Cæcilia Metella, daughter of Metellus Creticus, the wife of the younger Crassus, whose monument—a circular structure some 65 ft. in diameter—still forms a very conspicuous object in the Via Appia.

One of the many stately rooms on the first floor of the Farnese Palace is adorned with some fine frescoes by Annibale Carraci, chiefly of mythological scenes, executed by this artist with the assistance of his brother Ludovico, Domenichino, and other well-known painters of the period.

REAR ELEVATION OF THE FARNESE PALACE.

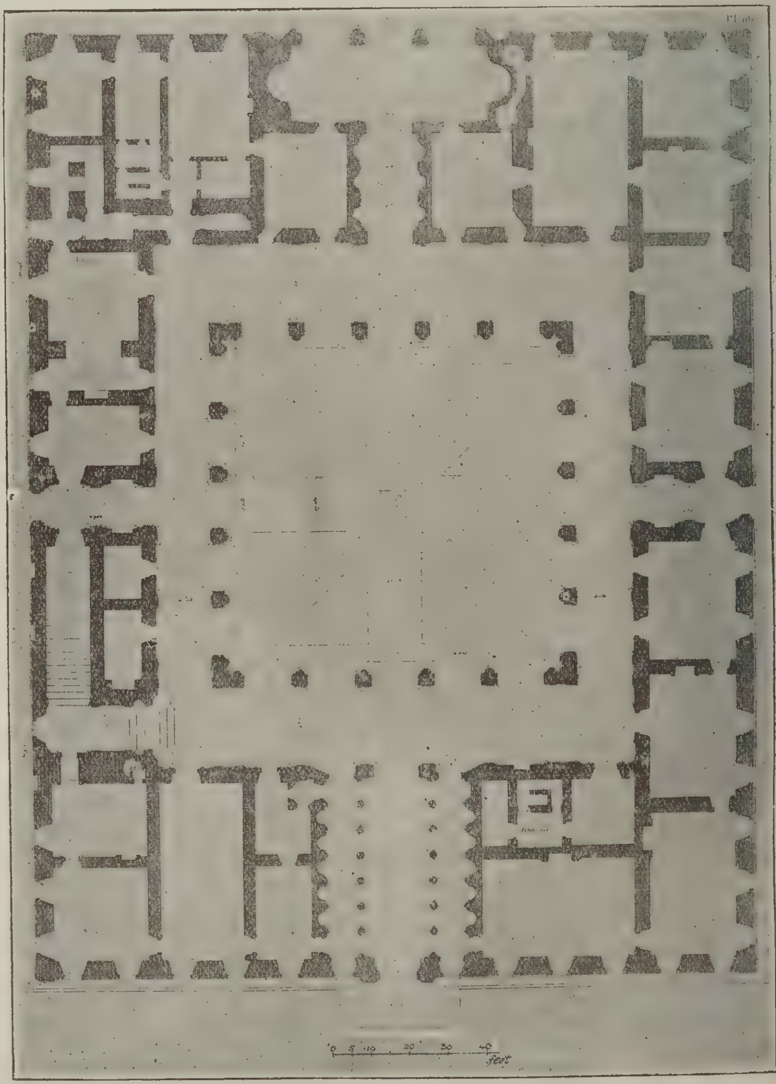
RAILWAYS AND THE BUILDING TRADE.

A Comparison Between British and Continental Lines.

In connection with the conference between British railways and British traders now proceeding at the Board of Trade (the subject of which has been fully dealt with in two articles published in THE BUILDERS' JOURNAL for February 26th and March 4th respectively), the following extract from an article in the "Dewsbury Reporter," by Councillor Myers, is of interest:—

"A comparison between the rates charged here and on the Continent works out very unfavourably to the British companies. The rate for machinery carried from Leeds to Hull is 25s. per ton, whereas carried the same distance in Belgium it is 8s., in Holland 5s. 6d., and in Germany 4s. 6d. per ton. Bar iron from North Staffordshire to London is charged 13s. 4d. per ton, whereas similar material travelling the same distance would cost in Germany 9s. 10d., in Holland 8s. 8d., and in Belgium 6s. 4d. per ton. Hardware sent from Birmingham to Newcastle would be charged 25s. per ton. Similar goods would be carried on an equal distance in Germany for 10s. per ton."

In reply to the foregoing, Mr. J. W. Parkinson, of the Great Central Railway, says:—"Councillor Myers states that machinery is charged from Leeds to Hull 25s. per ton (I cannot here give him the correct figure), but it will be at least 10s. less than what he says. Hardware, Birmingham to Newcastle, he quote at 25s. per ton. The actual rates are as follows: 40s. C.R., 35s. O.R.; for export only: 28s. 10d. C.R., 26s. 3d. O.R. . . . The conditions are so widely different that no fair comparison can be made between the railways of the Continent and this country. In Britain, for instance, most of the rates include collection and delivery of the traffic, whilst on the Continent none of them do. The Germans have two services for goods traffic, express and ordinary, and the rates by the express are double those of the ordinary. (Which of these rates has been used to obtain Councillor Myers' German figures?). Goods traffic is also carried to a limited extent on the express passenger trains at a charge of four times the ordinary goods rate. The State insists on having five and ten ton loads, and the public are in the hands of the forwarding agents, who must make up such loads before handing them to the railway. Such a system would not work to the satisfaction of the business men of this country."



THE FARNESE PALACE, ROME: GROUND-FLOOR PLAN.

Trade and Craft.

A New Chimney Pot.

The "Edwardian" chimney pot, which has been placed on the market by Messrs. Mark Fawcett and Co., of 50, Queen Anne's Gate, Westminster, is meeting with great success. We understand that orders amounting to more than 2,000 were executed in February, 100 of these pots having been used for the Duke of Westminster's estate. This is well-merited recognition, because the pot is of a particularly neat and effective design, in terra-cotta, and can be delivered at prices very little in excess of those for ordinary pots (the net cost, for new buildings of moderate size, being about 9s. each). At one time and another, innumerable special pots to prevent down-draught have been devised, but they have usually been ineffective or very clumsy in appearance. The "Edwardian" pot is free from both those defects, as it secures a good up-draught, prevents down-draught, and forms a thoroughly architectural finish to the chimney stack. It can be recommended to architects who want an effective chimney-pot at a very reasonable price.

Locks and Door Furniture.

All architects should have on their shelf Messrs. Colledge and Bridgen's new catalogue of locks, door furniture, etc., because it includes a great variety of patterns, with some particularly well-designed examples. Among door knobs, for instance, there are some dozens of excellent designs—not the familiar stock patterns of the builders' hardware merchant, but new designs of a far more pleasing appearance, and equally effective. And the same may be said of the latches shown. These, with one or two exceptions, exhibit the same appreciation of good design and suitability to purpose. Moreover, the prices are moderate—which is a very important matter. Casement fasteners are shown in great variety, as well as hinges, floor springs, etc. Mortice locks, rim locks, rim latches, etc., occupy a prominent portion of the catalogue, and a special section is devoted to fanlight openers, while door hangers and other fittings are fully dealt with. Safes and strong-room doors, and antique ironwork, also find a place in this catalogue, which all architects should make a point of getting from Messrs. College and Bridgen, Midland Works, Wolverhampton.

Notes and News.

"FRAZZI" FLOORS AND PARTITIONS are shown at the Building Trades' Exhibition now open at St. James's Hall, Manchester. There are two sections of "Frazzi" flooring exhibited—one with straight slab and joist-covers, concrete covered (which is the type which has been used for floors, mansard roof, etc., at the Piccadilly Hotel, London, to the extent of about 36,000 sq. yds.), and the other of arched form with joist-covers, suitable for factory work, and not requiring to be plastered. In connection with this form of construction it is worth noting that the walls and partitions of the administration building of the Windsor Hospital—a three-storey building with steel frame—are all constructed of "Frazzi" slabs, nowhere exceeding 3ins. in thickness; a special by-law having been passed by the Town Council admitting this building as a permanent structure, although the walls are only 3ins. thick and do not comply with the usual standard requirements in this respect.

* * *

MR. MERVYN E. MACARTNEY, surveyor to the fabric of St. Paul's Cathedral, was elected an "F.S.A." at last week's meeting of the Society of Antiquaries.

* * *

MR. ARTHUR VERCOE, A.R.I.B.A., for the past ten years manager to Mr. Albert L. Guy, F.R.I.B.A., of Gray's Inn, has commenced practice for himself as an architect and surveyor at 10, Culverley Crescent, Catford, S.E.

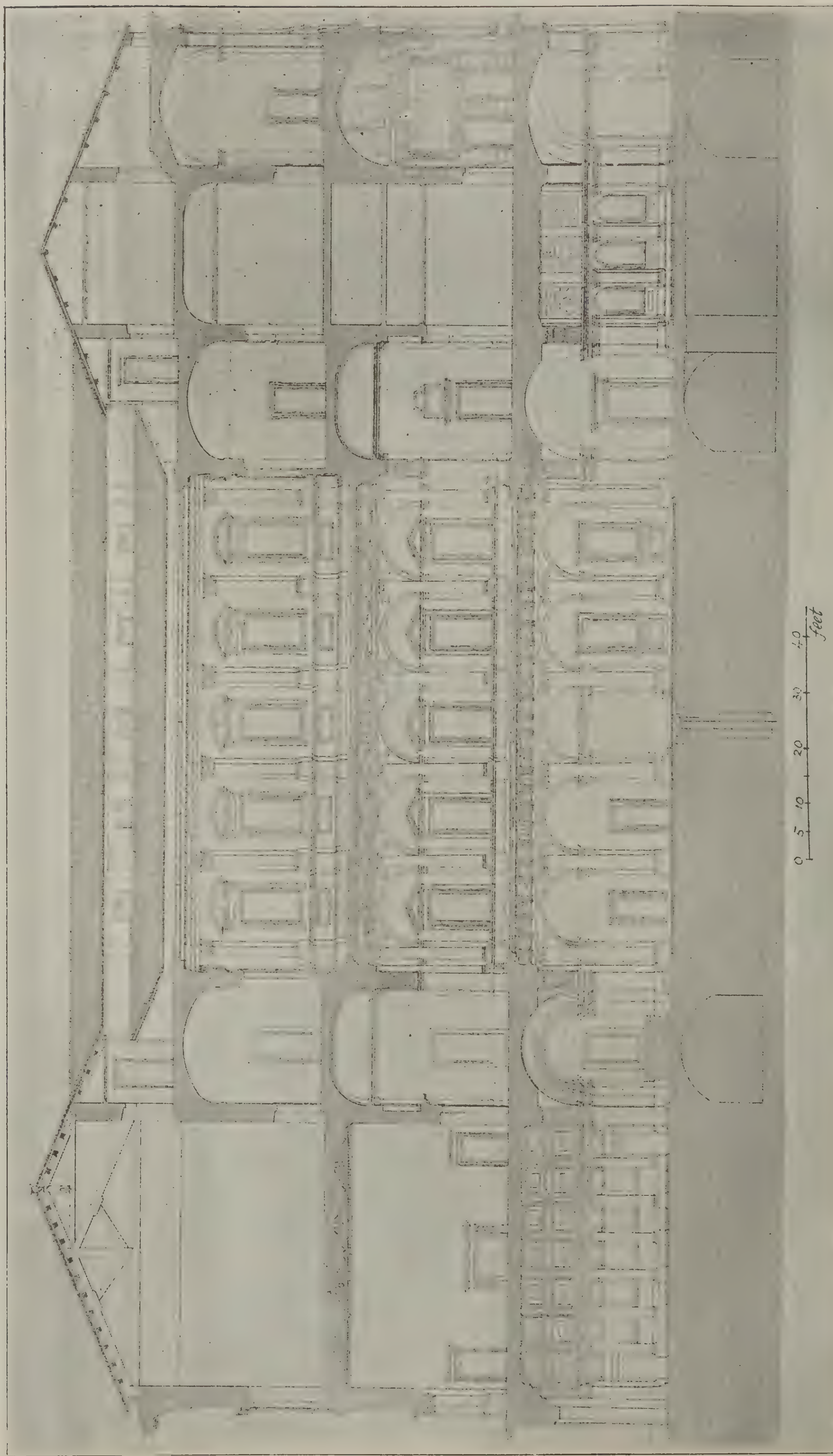
* * *

PORTSMOUTH MASTER BUILDERS AND THE BUILDING ACCIDENTS REPORT.—The 35th annual meeting of the Portsmouth and District Master Builders' and Building Trades' Association was held on March 3rd, when Mr. M. Coltherup was elected president for the ensuing year. Other elections were—Mr. G. J. Davis, senior vice-president, and Mr. S. Harding junior vice-president. In view of proposed regulations contained in the report of the Departmental Committee appointed to inquire into the dangers attendant upon building operations, a resolution was passed endorsing the efforts of the National Federation of Building Trade Employers in their recent appeal to the Home Office to have an opportunity of representing their views more fully by means of a deputation; and it was directed that a copy of the resolution be forwarded to the Home Secretary.

* * *

THE PROGRESS OF STAINED GLASS ART IN SCOTLAND.—A paper with this title was read before last week's meeting of the Edinburgh Architectural Association by Mr. Stephen Adam, F.S.A. (Scot.). Mr. Adam at the outset spoke of the undoubted progress of the art in the last fifty years, especially in the choice quality of the glass. He was confident that this progress would be maintained if increased attention were paid to the manufacture of special glass, as the Americans were doing, with "John Lafarge" leading. He would ask the younger generation of architects to be very gentle in their criticism of the stained glass produced about forty or fifty years ago in Edinburgh, and to remember that the excellent glass now so easily procurable could not then be had. There were nothing then but dead-flat sheets of the primary colours—red, blue, yellow, and green. Windows, to carry out the idea of a subject at all, had to be painted and enamelled, even embossed, to be made presentable. Beautiful the painting no doubt was, showing honest and careful technique. But now all was changed. The glass painter was at a discount; the lead worker and mosaicist reigned in his stead. Windows were now, or ought to be, leaded mosaics.

THE FARNESE PALACE: DETAIL OF ARCADE.



THE FARNESE PALACE, ROME: LONGITUDINAL SECTION.

Correspondence.

"Railways and the Building Trade."

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Referring to the article under the above heading in your issue for February 26th, we may presume that the grievances which the building trade suffers at the hands of the railway companies are common to all trades and industries; therefore, if brought prominently to the notice of the Commission now sitting, it would be unnecessary to obtain the appointment of representatives for individual industries. We should be well disposed to trust the discretionary ability of the gentlemen named in the article above referred to.

It has been vigorously advocated in certain quarters that the State should take over and work the railway system of the United Kingdom. This may be the ultimate issue. The time, however, is not ripe for such a transition. There can be no two opinions as to the advantages which would accrue by such a change. One section of the community would stand to suffer (namely, the shareholders), owing to the necessity of considerably writing down the capital invested; while the second section (the taxpayer who would unwittingly stand sponsor to the new conditions) might be called upon for a period to make up any deficiency. The trading public, however, would at once receive just consideration of its demands, and freights would be fixed to suit the exigencies of districts and the requirements of the trade of the country.

One of the greatest anomalies existing to-day arises through the unwarrantable amount of capital invested in railway concerns, and the over-anxiety of the management on behalf of the shareholders to earn a dividend upon same. There are instances where two companies serve practically the same districts, and, owing to their working arrangement, competition is stultified, and no other result accrues than the abnormal inflation of rates for carriage upon merchandise.

As a means of bringing the Railway Boards to an accurate knowledge of the situation, and a sense of their respective responsibilities to the public, the Government should encourage the development of transit by canals, which, owing to disuse, could be acquired at a figure which, if worked by a competent Canals' Board, would revolutionise the railway companies' charges for freight upon merchandise.

The existing powers possessed and enforced by the railway companies to refuse to carry certain goods except at owner's risk is an anomaly which should be strenuously resisted, and an Act should be passed compelling them to carry such goods at an approved rate commensurate with the risk (if any). It often happens that such consignments are very carelessly handled and considerable damage sustained, chiefly in shunting operations, the responsibility for which the railway company unjustly repudiate, shielding themselves behind their by-laws.

The manufacturer should possess the privilege of paying a rate to ensure sound delivery of all classes of goods.

The burden of packing goods which, from experience, can be carried unpacked without undue risk, is an anomaly that should be removed.

The carriers are very careless in treatment of returned packages, often, it may be, unintentionally allocating a signature they hold for quite a distinct assignment, thus causing needless correspondence and giving the consignor an unfavourable impression of the integrity and business capacity of his merchant.

The building trade is essentially a home industry, and as the materials requisite for its development are only produced in centres often far removed from the districts where actually required, its advancement is greatly dependent upon the facilities afforded by the carriers in speedy, safe, and economical transit.

We consider the best thanks of those interested are due to the writer of the article, and also to the publishers of THE BUILDERS' JOURNAL, for so enthusiastically taking this important matter in hand.

Trusting some substantial good will arise therefrom,

We are, Yours Faithfully,

YOUNG & MARTEN, LTD.
(E. Montague Edwards, *Managing Director.*)

London, E.

The London County Hall Competition.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Taking advantage of the opening of your columns to discussion of the selected design for the London County Hall (which design the assessors have commended in such judiciously vague terms), I desire to make the following observations:—

In Mr. Knott's plan no attempt is made at axial planning, but ill-lit corridors of extreme length abut into a circular form or divide up the plan into the obsolete commercial type.

Areas run east and west instead of north and south. Courts 70 ft. wide and 90 ft. high make the angle of light considerably less than 45 degs. in the basement. Large portions of the reading room and library (both ill-balanced rooms) are more than 50 ft. from a window, and that behind a screen.

The only route by which councillors, after a division, can return from the division lobby to the council chamber, is long and circuitous, and involves mixing with the ordinary stream of traffic in the building—an instance of the complete disregard of the arrangement adopted at Cardiff, which has established a system recognised as the most satisfactory.

The possibilities of the detached hall in relation to its position are in no way realised; its only advantage consists in the ease with which it can be removed. Its retention would deprive the surrounding rooms of light, while its removal would leave a crude cut into the face of the building.

The whole is an unresolved conception of straight lines, revealing no grasp of the great possibilities. It is not even vulgarly grandiose, and, in point of convenience, not comparable to the brilliant plan of Messrs. Lanchester and Rickards. Its acceptance can be accounted for only by reason of its cheapness, which promised the possibility of erection under the new *régime*.

Reference to a plan or perspective reveals the fact that the four containing masses on the river front do not read together, that they are not of equal projection, and the consequent weakness of the angles which the centre projections make with the face of the building is apparent; there is no respond in the angles to the inadequate corner blocks, over which the roof does not break — leaving them as irrelevant exrescences; their repetition on the other sides betrays mere poverty of invention, and their isolated position at the ends of the centre projections on the river front is inexplicable.

The prototypes of the unfortunate screen colonnade, the innumerable dormers, the exaggerated chimney-stacks (competing with the common centre feature), and the underscale windows—all natural foibles in the circumstances—are familiar.

In the larger surfaces of the facades, upon whose abruptly terminating rustication the keystone epidemic flourishes, is displayed in a facile combination of affected simplicity (mistaken by the ignorant for breadth of treatment) and debased rococo detail.

There is no fine and subtle resolution of parts, no realisation of scale, no vigour or imagination, but a grotesque emphasis given to domestic features, and an insistence upon everything that is foreign to monumental composition.

Finally, the detail: In the past, comprehension of the significance of classic motives was held essential, and refinement was admired. The selected design is characteristic of current fashion. We have huge keystones supporting nothing; a main entablature for the like of which one must go to Berlin; curved, sinuous pediments; pediments with a single fillet made to do service for the full complement of members; architraves bent round and carried over window cornices; mouldings more than Roman in their coarseness, and misused with ignorant facility; attic blocks *battered;* windows neither in the frieze nor the the architrave, and interrupting both; disfiguring *Art Nouveau* ornament; sculpture crudely applied; the "in antis" motive abused by a trivial break in the main entablature; and so on.

So much for this design.

Yours truly,

ZOILUS.

Liverpool.

P.C. Sums.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Some of your readers may find interest and perhaps a little amusement in the following excerpt from a letter written by a large firm of manufacturers in reference to p.c. sums in quantities:—

"Being specified is not all honey, for builders are upset if they can't get something from us. This accounts for Messrs. X—— and Co.'s annoyance. Then they must not be asked for payment when it is due, if we are specified *Vide* Messrs. Y—— and Co. But Z and Co. go one better — make vexatious and unjustified deductions, and then pose as martyrs on our pulling them up. And they all try to poison the specifier's mind against us. Our lot is not a happy one. If we were to put 10 per cent. on for the builder, he wouldn't be satisfied then, and probably would call on the architect, saying how much cheaper he could buy elsewhere—even as he does now. It is useless trying to please everybody, so we must just get through as well as we can."

This complaint, as any manufacturer will readily admit, is only too true. When, for some reason (which may be a perfectly justifiable one), an architect desires to make sure of getting a particular manufacture, and specifies it, noting a p.c. sum in his quantities, and "add carriage profit and fixing," if a contractor chooses not to add these to his estimate it is extremely unfair to expect the manufacturer to give him a profit, or, failing this, to unfairly prejudice an architect's mind against him. There is so much competition now in the building trades that most manufacturers have cut their

prices down to a minimum profit, and there is no room for benevolence, even with the kindest of intentions. It is seldom nowadays that architects buy in any but the cheapest market (quality being the same).

It is a fact that many even of the larger builders appear to forget or ignore this; so, if this letter should induce one or two of the least hardened to remember that (in spite of American business methods of the "We-want-your-money" type) there is still some virtue in the old saw, "Live and let live," it will not have been published in vain.

Yours truly,
A. E. F.

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

C arges for Variations on Contracts.

"H.P." writes: "I should be glad to know the proper method of charging for the adjustment of variation accounts. Supposing the net extras are £100 on a £1,000 contract, but by placing the prime-cost allowances on the deduction side, and also work as specified, and placing to extras the invoiced cost of goods and work done, the extras and deductions will total £1,400. Is a charge of $2\frac{1}{2}$ per cent. on this last-named sum justified? In the case about which I am really inquiring there was an allowance of £500 for heating apparatus, and the cost was within a pound or two of this sum. Is the general contractor liable to pay on the two sums of £500 for adjusting (if it can be so called) an account which is not his?"

The usual architect's charges for variations on a contract are:—

On the amount of extras	$2\frac{1}{2}$ per cent.
On the amount of omissions if involving measurement	$1\frac{1}{2}$ " "
On the amount of omissions if not involving measurement	1 " "

F. S. I.

A Three Weeks' Tour in Italy.

MANCHESTER.—"Cheetham Hill" writes: "My father and I purpose having a three weeks' tour in Italy. Can you advise us as to the best route, time of year to start, places of interest, hotels, cost, etc.? I am an architect's assistant, but my father not being in the profession, I do not wish to visit places interesting to architects only, although I desire to make the tour as valuable as possible to my work."

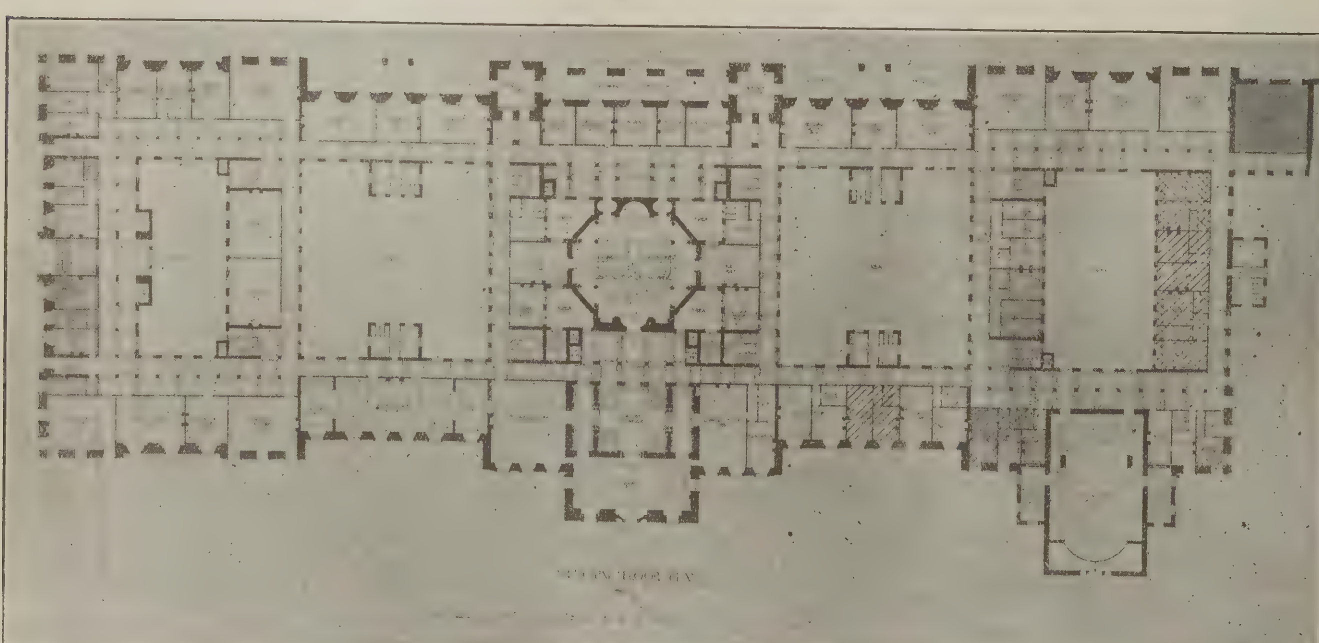
You would probably get settled weather during the last three weeks in May, without it being too hot. Go straight through to Genoa, and from there go on to Florence, stopping a day at Pisa en route. (Pension Devciche, 84, via Cavour, Florence, $4\frac{1}{2}$ francs a day, can be recommended). Then I would suggest Verona, Venice, Milan, and Como, returning by the St. Gothard Railway to Lucerne and home (Verona, Hotel Accademia, $5\frac{1}{2}$ francs a day; Venice, Pension Grande, 5 francs a day). For other hotels, Baedeker's lists are quite reliable. Your expenses for three weeks, not including the fare there and back, should come under £10 per head. If you wish to see more places, with less time at each, there are many towns on this route which are extremely interesting architecturally, but, of course, the larger places are more attractive to the ordinary visitor. To name a few—Bologna, Ferrara, Padua, Vicenza, Brescia, and Bergamo, which are the more profitable to a student; while Ravenna and Mantua (the former being especially interesting to the architect) lie only a little off the route selected. But Genoa, Florence, Verona, Venice, and Como alone would make a splendid three weeks' tour, and to try and cram in more would perhaps spoil the whole visit. A. P.

Sanitary Inspectors' Examination.

STOCKTON-ON-TEES.—"R. B." writes: "Being anxious of entering into the sanitary inspectors' examination with success, I shall be glad to know of an inexpensive way of achieving my aim; also some good books, or a course."

You should apply to the secretary of the Royal Sanitary Institute, Parkes' Museum, Margaret Street, London, W., for full

Elevation to River.



LONDON COUNTY HALL. DESIGN BY JOHN BELCHER, A.R.A.

particulars of the examinations held by the Institute for the granting of certificates in the various branches of sanitary inspection. Instructions to candidates, besides detailing the subjects required by the Board, insist on the importance of practical training and observation, facilities for which are granted by local authorities, on the requisition of the Institute, to students entering for the examinations. The application for information should be accompanied by a request for a pamphlet containing particulars relating to the several examinations, with copies of the papers set at previous examinations, and other useful information. The price of the pamphlet is 6d. (postage extra). Books recommended for preparation for the examinations would depend upon the particular branch for which the candidate wishes to qualify. He should first obtain a copy of the Public Health Act (price 5s. 7½d.). "Hygiene and Public Health," by Parkes and Kenwood (price 12s.), would undoubtedly prove useful, and Fletcher's "Architectural Hygiene" (price 5s.) is another book giving much useful knowledge in a concise form. B.

A North-Light Roof.

LONDON.—"Saw-Cut" writes: I have to construct a building with saw-cut or north-light roofs, and I should like your suggestion as to the most suitable form of wooden trusses to adopt. The span is 24 ft. 9 ins. between brick piers, the length of rooms 32ft. 9ins. inside, and the walls are 13½ins. and 18 ins. by 4½ in. projections to form piers under trusses. One roof is to be covered with glass on the north side (60 deg. pitch), with sky-lights to open, and slates to (30 deg. pitch) the south side, and the other roof to be slated on both sides, the north side to have sky-lights to open and a match-boarded ceiling."

A plan of the rooms should have been sent to show the positions of piers, etc., as there might be either two or three piers on each side, and this would affect the loads to be allowed for, by reason of the spacing of the trusses. Assuming Fig. 1 to be the plan of one of the rooms, Fig. 2 will be the frame diagram with the wind against the long side, allowing for trusses 25 ft. 6 ins. span, 8 ft. centre to centre, 28 lbs. per sq. ft. structural load, snow, etc., vertical, and 28 lbs. per sq. ft. wind-pressure normal to slope. Fig. 3 will be the corresponding stress diagram. Fig. 4 the frame diagram, with wind on the short side of the truss, and Fig. 5 the corresponding stress diagram. The stresses in the various members are marked on the two frame diagrams; taking the maximum for each, the calculations will be as follows:—The principal rafter has a maximum stress of 75 cwts. and an unsupported length of 88 ins. Try a 6 in. by 5 in. section; then

$$W = \frac{F\,S}{1 + \frac{1}{a}\left(\frac{l}{d}\right)^2} = \frac{12 + 30}{1 + \frac{1}{100}\left(\frac{88}{5}\right)^2} = 88 \text{ cwts.}$$

Strut 11-12 has a maximum stress of 43 cwts. and a length of 116 ins. Try a 5 in. by 5 in.: then

$$W = \frac{12 \times 25}{1 + \frac{1}{100}\left(\frac{116}{5}\right)^2} = 47 \text{ cwts.}$$

Strut 13-14 has a stress of 32 cwts. and a length of 88 ins. Try a 4 in. by 5 in: then

$$W = \frac{12 \times 20}{1 + \frac{1}{100}\left(\frac{88}{4}\right)^2} = 41 \text{ cwts.}$$

Strut 9-10 has a stress of 22 cwts. and a length of 75 ins. Try a 3 in. by 5 in: then

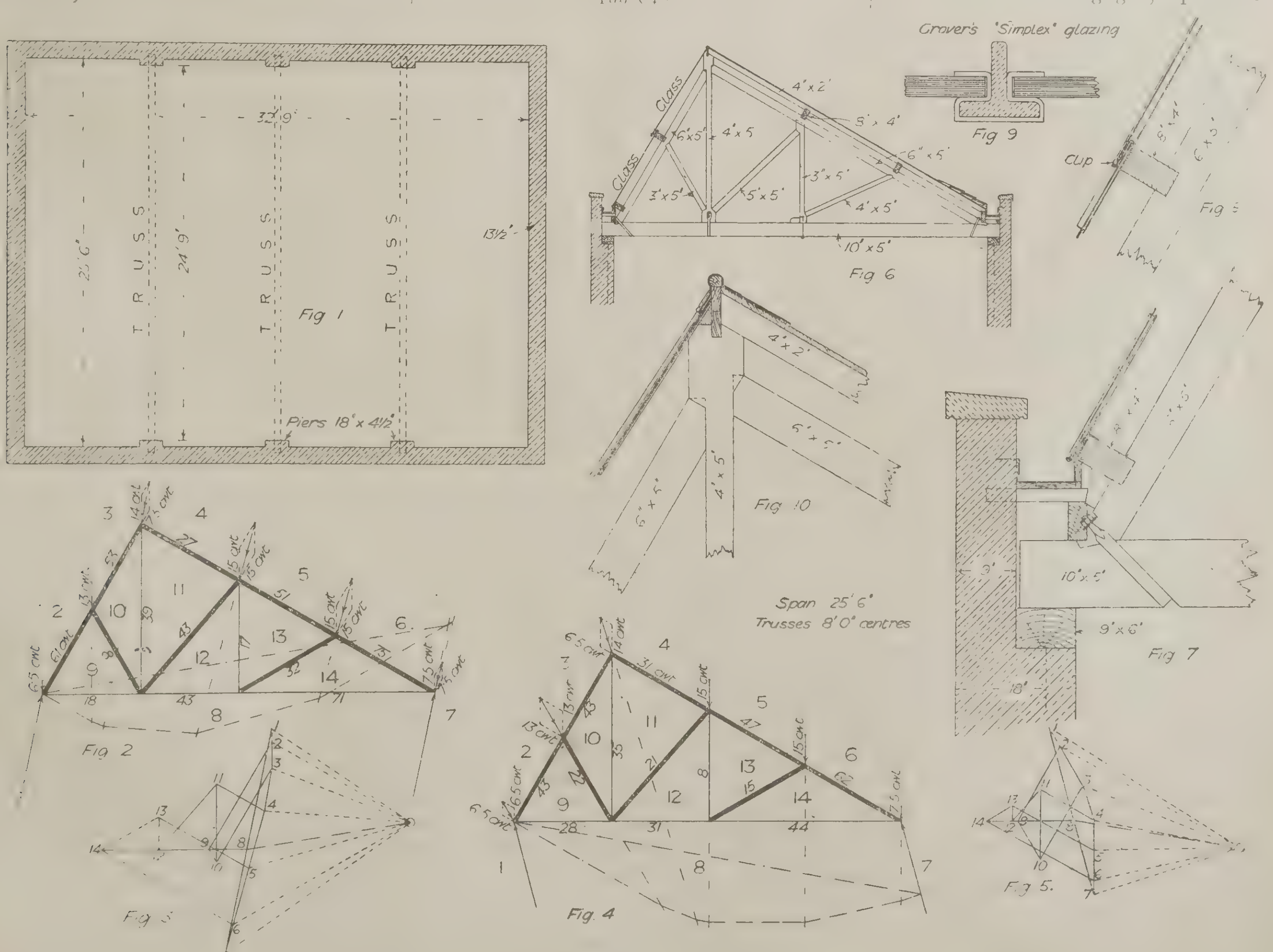
$$W = \frac{12 \times 15}{1 + \frac{1}{100}\left(\frac{75}{3}\right)^2} = 24 \text{ cwts.:}$$

so that these sections will do for the members in compression. Allowing 2 cwts. per sq. in. for tension members, 10-11 will require $\frac{39}{2} = 20$ sq. ins., say 4 ins. by 5 ins Member 12-13 will require $\frac{17}{2} = 8{\cdot}5$ sq. ins., but should not be made less than 3 ins. by 5 ins. The tie-beam will require $\frac{71}{2} = 35{\cdot}5$ sq. ins., but should be made 10 ins. by 5 ins. to allow for its weight and other contingencies. Fig. 6 shows the complete section through the roof, with elevation of truss, upon which the scantlings of the various members are marked. Fig. 7 shows an enlarged section at the foot of the short side, Fig. 8 a section through the joint in the glazing, Fig. 9 a section through the glazing bar, and Fig. 10 the head of the truss.

HENRY ADAMS.

Schedule of Dilapidations.

"VIATOR" writes: "A mortgagee is in possession, *i.e.*, he has appointed a receiver to collect the rents and to pay the outgoings of an estate. The mortgagor is a man of no substance, and the original lessee cannot be found. The freeholder knows that the mortgagee is in possession, because the ground rent has been paid to him by the receiver. He calls upon the mortgagee and tells him, in course of conversation, that he is thinking of serving a schedule of dilapidations. As there is no privity between freeholder and mortgagee, I presume that



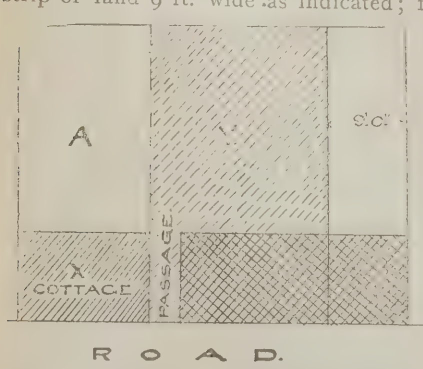
A NORTH LIGHT ROOF TRUSS.

the schedule would be served upon the mortgagor. If this is done, and the mortgagor neglects to, or is unable to, comply with the schedule, (1) What may the freeholder do to preserve his property? (2) Does the mortgagee run any risk of losing his security? (3) If the original lessee and the subsequent assignees either cannot be found or are men of no substance, upon whom would the burden of carrying out the schedule rest?"

The law of mortgagor and mortgagee is always of an intricate character, and I strongly recommend that nothing be done in the circumstances detailed except under the advice of a solicitor. A mortgagee in possession is undoubtedly liable to keep the property in repair, and may be held responsible for damages to the premises if he neglects to so properly repair them; he should, however, always be in a position to render accurate accounts of all money so expended, as the mortgagor is bound to recoup him for any proper outlay for repairs. Speaking as a layman, I am of opinion:—(1) That as the receiver is deemed to be the agent of the mortgagor (Conveyancing and Law of Property Act, 1881), the freeholder may serve notice of dilapidations upon him. (2) The mortgagee runs some risk of having it impaired if the dilapidation claim is a heavy one, but I do not think he runs much risk of forfeiture. (3) I do not suppose any of the covenants to repair were personal to the first lessee, and therefore I do not think his absence is of any consequence. The mortgagor is the person now responsible in law, but if he is a man of no substance, the receiver must execute the repairs out of current revenue. X.

Leasehold.

BORTH.—"H" writes: "The whole of the plot marked A on the accompanying sketch belonged to a person named X, who owned the cottage shown hatched in. X sold to another person, Y, the remainder of the plot (dotted). The plot was not large enough for Y to build a house on, so he bought as leasehold a strip of land 9 ft. wide as indicated; for



this Y used to pay 6d. a year, but for the last twenty years has not paid anything. The leasehold for the dotted plot expires in four years. (1) What will happen to the house, as 9ft. of it is on the 9ft. strip? (2) Can Y now claim this strip, and will X have to pay him ground rent for same? (3) Y's boundary is described in the deed as being the cottage on one side, but when he built he left a passage as marked. Can X, after using this passage for forty years, now claim a right to same?"

(1) X, as the freeholder of the land on which the larger portion of the house stands, cannot be entitled to more than the reversion of his own portion: he cannot touch the 9ft. strip, nor the part of the house built upon it. (2) Y cannot claim any interest on the strip, beyond that of lessee; the freehold is certainly not his. He entered into a lease (a document under seal, because it was to run for more than three years), and he must surrender the 9 ft. strip to the freeholder to whom it belongs; the non-collection of the reserved rent will not prevent the freeholder from taking possession when the lease runs out; it was, in fact, the legal duty of the lessee to search for the lessor in order that he might perform his covenant to pay the rent to him. Of course, the case will be further complicated if the two leases do not expire at the same time! And will be still more involved if the freeholder of the strip cannot be found. (3) Yes; though, as I understand X to be the freeholder, I do not quite grasp the point of your question. This seems to be distinctly a case for amicable arrangement between the two freeholders, and I suggest that the larger owner should purchase the interest of the smaller. F. S. I.

Public Health Amendment Acts.

SOHAM.—"Sm." writes: "I shall be glad to know whether any Public Health Amendment Acts have been passed since 1903, and where copies of these may be obtained."

A list of all the Public Health Amendment Acts which have been passed since 1903, together with the prices at which copies of each can be purchased, may be obtained from Messrs. Eyre and Spottiswoode, East Harding Street, Fleet Street, E.C. T. E. C.

Special Boiler Lid.

ROYSTON. "N" writes: "Where can I get a boiler lid of the pattern shown on sketch (not reproduced)?"

These are made to the order of wholesale builders' merchants, I believe, and thus vary in design. If you have difficulty in obtaining one, it can be made at a reasonable price by a local sheet-metal worker, in zinc, or in iron, afterwards galvanised. The iron may be painted, and will last long if kept painted. X.

Views and Reviews.

The Law of Building and Dilapidations.*

We welcome this new book by Mr. Ernest Todd, containing a critical examination of the law affecting all kinds of building contracts, agreements, and leases in general, including:—

(1) The form of contract issued by the Royal Institute of British Architects.
(2) The lump sum contract.
(3) The measure and value contract.
(4) The house-breaking and demolition contract.
(5) The building agreement with or without advances.
(6) The different kinds of building and occupation leases and agreements, with model forms of each.

The book works out in detail the form of contract and conditions published by the R.I.B.A., gives the architect and builder warning of the dangers lying in wait for them under some of its clauses, and tells them how, by making certain alterations in the Form and taking certain preliminary precautions, they can best avoid these dangers. Mr. Todd also deals with the difficulties as to recovery of amounts due on certificates raised by the decision of the Court of Appeal in *Robbins v. Goddard*, criticising the decision in this case. He points out that "one thing, however, is certain, namely, that an employer acting under this form of contract, when he fails to pay and is sued by the builder, only has to repudiate the architect, his own agent, and say that the work or materials are not in accordance with the contract or specification, to prevent the contractor recovering at law the amount of his certificate until such time as his allegations have been exhaustively enquired into, either by the arbitrator appointed by the contractor or by an official or special Referee," and proceeds to sum up the practical results of this decision: "As the law now stands it would be most imprudent for a contractor to enter into a contract in the printed form without inserting in Condition 30, after the words, 'No certificate of the architect shall be considered conclusive evidence as to the sufficiency of any work or materials to which it relates, nor shall it relieve the contractor from his liability to make good all defects as provided by this agreement,' the words, 'The employer nevertheless shall not be entitled to refuse to pay any certificate duly signed by the architect, except on the ground of the architect's fraud or collusion with the builder'; and in Condition 32, after the words, 'the arbitrator shall have power to open up, review, and revise any certificate, etc.,' the words, 'except certificates for payments on account given in pursuance of Condition 30.'"

There is also a chapter on dilapidations and fixtures, and on each of the following subjects:—(1) Variations and extras; (2) specifications and bills of quantities; (3) the architect's powers and duties; (4) the progress and completion of the works; (5) damage to persons and property arising during the work; (6) certificates and payments, prime cost and provisions; (7) arbitration and procedure. The appendix contains the following:—Forms of contracts, leases and agreements; forms of pleadings, applications, particulars, orders, etc., in building actions and arbitrations; forms of submissions and awards; rules of the Tribunal of Appeal under the London Building Act, 1894; Ryde's scale of surveyors' charges; the professional practice as to charges of architects; a form of order for relief against forfeiture under the Conveyancing Act, 1881; text of the London Building Acts, 1894, 1898, and 1905, with the by-laws, regulations, and rules of the London County Council made thereunder.

The book is written in very readable form, and is a thoroughly clear and practical exposition of the law relating to building and dilapidations. We imagine few architects' or builders' offices will be without a copy. Certainly, if the warnings as to the pitfalls contained in the usual form of building agreement are given heed to, we shall hear considerably less of building and arbitration disputes than heretofore.

* "The Law of Buildings and Dilapidations," by Ernest Todd, of the Inner Temple. London: Eyre and Spottiswoode. Price 15s.

Obituary.

Mr. D. R. Dale, F.R.I.B.A., of London, E.C., died on February 29th. He was district surveyor for West Streatham for a number of years, and carried out many large buildings.

Mr. Charles Gott, M.I.C.E., of Bradford, died recently. He was formerly borough surveyor and waterworks engineer to the Corporation, and was associated with many large works of civil engineering in Yorkshire.

THE ARCHITECTURAL ASSOCIATION.

Mr. P. L. Forbes on Water-colour Painting for Architects.

A meeting of the Architectural Association was held on Friday evening last at 18, Tufton Street, Westminster, the chair being occupied by the president Mr. Walter Cave.

It was announced that the annual dinner of the Association would be held at the Gaiety Restaurant on April 9th.

Mr. W. J. L. Horsman was elected a member of the Association.

Mr. P. L. Forbes then read a paper on water-colour drawing for architects, or, as the author preferred it, water-colour *painting*, which he contended was the more correct term when applying to present-day work.

The Old and the New Method.

"Drawing" was correct for pictures done before and during the earlier period of Turner's life, for then the method was, after the outline had been drawn in, to shade up with Indian ink or brown, and finally to put faint washes of blue, yellow, red, green and brown over the whole, so that the strength of the drawing was not obtained by the colour, but by the darks which had been put in underneath. It is, however, a very different matter nowadays, when the whole painting, from highest light to deepest dark, is put in in colour, and many water-colours will hold their own in depth of tone and richness of colour with pictures painted in oils. Mr. Forbes pointed out that water-colour work was to architects an hereditary birthright, having been taken up by their predecessors, before painters, in the eighteenth century; for, when Paul Sandby, who is justly called the father of English water-colour painting, was born in 1725, the art of tinting drawings with washes of transparent colour was generally practised by architectural draughtsmen.

Essentials.

Having urged the importance of a close study of Nature, through which means alone could one become a good colourist, Mr. Forbes proceeded to enumerate the qualities that went to the making of a picture, these being good drawing (which was all-important), composition, chiaroscuro (light and shade), and relative values. In securing the last named, he said it was excellent practice to do black-and-white sketching with Rowney's blue-black—the finest pigment for the purpose, as it was always transparent, however thickly laid on. "There are several ways of finding the relative values of objects; one is to bend down and look at the view through your legs—a not very elegant position, and calculated to cause onlookers to doubt your sanity, but a very useful method. The best way, however, is to look at the scene through half-closed eyelids through your eyelashes; all the fussy little details will then be eliminated and the general masses only will appear; and do not try to paint more than you can thus see through the half-closed eyelids."

It was imperative, also, to avoid what might be called

"Nursery Traditions,"

which led one to believe that "the sky and the sea are blue, the grass is green, bricks are red," etc.—to get rid of these preconceived notions, and to paint the colours as one saw them, because the sky might appear pink, green, slate colour, etc., not to mention the many tones of the clouds; grass might seem yellow, green, bluish, or even red; trees might look purple in an evening light; and bricks, slates, and tiles (thank goodness) took on the most beautiful colours. To paint things as one saw them was to get aerial perspective—the colour of objects seen through the atmosphere. Constable had pointed out that painters should not think that the sky terminated at the horizon, but should realise that it came all through the picture.

Skies.

Mr. Forbes went on to speak of the painting of skies, incidentally paying a tribute to his former water-colour instructor, Mr. A. W. Weedon, R.I., whom he regarded as the finest painter of skies we had ever had.

In some books on water-colour painting it was stated that the way to paint the sky was to put the blue in first, leaving white spaces for the larger clouds; but that, in Mr. Forbes's opinion and experience, was putting the cart before the horse. The following method was far the most satisfactory: Having blocked in the clouds lightly with charcoal or pencil, paying particular attention to the composition with regard to the landscape, run in the lightest tones, then the shadow sides and underneaths of the biggest mass first, often at the top of the paper, because the clouds highest up are nearer and therefore appear larger; then, in a similar manner, treat the lower ones, which grow smaller and smaller till they reach to near the horizon, which in a clouded sky is best kept broad and simple; finally put in the blue.

The great secret of success in sky painting lay in ability to draw with the brush, having the same power over and freedom with it as with charcoal or soft pencil.

How to Paint Buildings.

Speaking of painting buildings, Mr. Forbes said: "Lay over the walls the general effect of the broken tones, drawing in with your brush the suggestions of the stones or brickwork afterwards. The same method applies to roofs. Put on the shades and shadows last of all. Be sure that you put on the shadows all at the same time, so that they all go in the proper direction. I once saw the sketch of a town done from a window; it had been begun in the morning, and continued in the afternoon and evening. The shadows of chimneys, etc., on the houses had been put on as each house was painted, so that in the finished sketch they radiated like the spokes of a wheel. This, of course, was an extremely amateur case, but I mention it to show how necessary it is to put in the shadows all at the same time as far as possible.

"You all know better than I do the construction of windows and doors, so that it is quite superfluous to say anything about the putting of them in except this—be sure and put them in, however slightly, with a suggestion of their construction, for here again I have seen many an architectural subject spoilt by the poor way they were treated. In saying this I do not mean to suggest that your drawing should in any way be what is called 'tight'—loose-handling and freedom of touch is everything in painting. But do not, for instance, put in all the sash bars with a hard, black line; lose some of them, especially if rather distant, so that your picture may be atmospheric."

Copyism.

Finally Mr. Forbes urged students not to try to copy the style of any artist whose work they might have taken a fancy to. "Study him if you like, delight in his creations, but remember that no two men see things exactly alike, and that you, though admiring and learning of others, must look at things with your own eyes and put your own individuality into your work; then, and only then, will that work be successful."

Discussion.

A vote of thanks was proposed by Mr. John D. Crace. In the course of his remarks Mr. Crace pointed out that sienna should not be used with cobalt, on account of the presence of iron, which, in a short time, set up chemical action and destroyed the colour. Mr. C. H. Strange seconded the vote of thanks, observing that water-colour drawing had very much improved during the last few years, as shown at the Exhibition of the Association. Messrs. E. Gunn, W. Bainbridge Reynolds, W. G. B. Lewis, Cecil Sharp, and T. C. Yates supported the vote of thanks, which was then formally put by the president with a few interesting remarks, and carried in the usual way. Mr. Forbes replied, and the meeting terminated.

Exhibited around the room were various water-colour paintings by Mr. Forbes, which were studied with much interest.

THE PROPOSED SCHOOL OF ARCHITECTURE AT CAMBRIDGE.

Discussion in the Senate.

The report of the Diploma in Architecture Syndicate has recently been the subject of a lengthy discussion in the Senate at Cambridge, and many of the speeches delivered on the occasion contain suggestions of the greatest value to the architectural profession. As, however, during the course of the protracted and verbose correspondence which has lately taken place in the "Times," the views and proposals of the syndicate have become somewhat obscured, they are here epitomised for the guidance of those interested in the question.

There is no doubt that the education of architects in this country is in an unsatisfactory condition, and it is felt to be so by architects themselves. The principle of apprenticeship is on the wane, while nothing has yet been satisfactorily devised to take its place. The leading members of the profession agree with the syndicate in believing that a sound general education on liberal lines is the greatest desideratum, supplemented by special instruction in the principles of construction, in history and in art. In view of the importance of forming an intelligent public opinion appreciative of architectural design, the syndicate have had in view the needs of students who are members of the University, and who desire to study architecture, whether intending to be architects or not.

Whilst the syndicate do not propose at the present time to institute a complete scheme of work, or a scheme for a diploma, they are unanimously in favour of establishing an examination which shall adequately test the preliminary training for the architect's profession, and shall count as a special examination for the ordinary B.A. degree. The examination would no doubt be taken chiefly by those intending to be architects who wish to utilise a portion of their time at Cambridge in preparing for their profession, but it is hoped that there would be other candidates whose interest in Architecture will not necessarily be professional, and that thus the proposed examination would supply increased opportunities of liberal education in connection with the ordinary B.A. degree.

In drawing up the regulations for the proposed special examination, the syndi-

cate have borne in mind that architecture may rightly be described as both an art and a science, and that an adequate knowledge of its history, and its relation to art in general is important to anyone who desires to practise it. The first part deals with the mathematical and scientific principles on which the practice of architecture is based. The second part comprises the history and theory of architecture and the allied arts.

The syndicate are of opinion that the examination should be one of the special examinations, divided into two parts, which are held twice in each year, and that the detailed regulations for the examination be as follows:—

Architecture.

Part I. shall consist of five papers, namely:

(1) Practical mathematics.
(2) Elementary applied mechanics.
(3) Strength of materials and elementary theory of structures.
(4) Descriptive geometry; projection of solids.
(5) Surveying, being a practical examination in field and office work.

Part II. shall consist of five papers, namely:

(1) Outlines of the history of architecture of Europe and the near East.
(2) Outlines of the general history of art.
(3) Architecture and the allied arts of the following periods: (a) Classical; (b) mediæval; (c) Renaissance and modern.
(4) Subject for an essay relating to the period chosen by the candidate in paper (3).
(5) The theory of art in relation to architectural design.

On the presentation of the syndicate's report, on January 30th last, the proceedings were opened by the Vice-Chancellor of the University, who explained why his signature had not been appended without qualification to the report, the reason being that, in his judgment, the syndicate commenced their work at the wrong end, and that they should have first decided what should be the very highest test that the university ought to impose, and should then have determined the intermediate examinations or tests which would lead up to the final distinction. He invited remarks on the report.

Opposition to the Special Examination.

Mr. A. Hutchinson very much regretted the introduction of the special examination. The syndicate were appointed to consider the desirability of instituting in the university a Diploma in Architecture. They said in their report that they did not see their way at present to proposing anything like a complete scheme of work or a scheme for a diploma, and they suggested instead a special examination. They had quite enough special examinations already, and there were other and better ways of encouraging the study of a subject. Whilst he did not consider that the time was ripe for establishing a tripos in such a subject as architecture, yet he was in favour of the institution of a diploma, because a diploma could be made an honours examination without the time limit which was necessary in the case of a tripos. Therefore, he hoped the syndicate would make another effort to frame a scheme for a diploma.

An Unfair Attack.

Mr. Marshall thought that the attack which had been made upon their proposals in the "Times" was most unfair. The gentlemen who made it had first declared that the university was the wrong place to go to for technical education. Then, when the university drew up a scheme putting aside technical education—education in architecture proper—confining their attention to the science upon which architecture was founded, together with the history of architecture, their critics turned round upon them and said they had altogether missed the mark, that they had not provided a proper education for the architect or a substitute for apprenticeship. There was no idea of a substitute for apprenticeship, as it was always understood that the student, after having passed the education arranged for in the scheme, would have to put his foot on the bottom rung of the ladder and work his way up, in constructional architecture. In the scheme before them there was no teaching in architecture. Architecture was kept out of it. Subjects allied to architecture were to be taught, but not architecture itself. That was the main point he desired to make in order to explain the reason why he was opposed to the granting of a diploma on the scheme of study proposed which would be of advantage to young men going into the architectural profession, and they could follow that proposed course without losing part of their general education, by specialising in that subject rather than in any other during the last year and a half of their time at college.

Professor Ridgeway's Opinion.

Professor Ridgeway thanked Mr. Hutchinson for his excellent criticism, and pointed out that he himself, like the Vice-Chancellor, had only signed the report recommending a special examination in architecture, in order to have something to place before the Senate, and to show what they had been able to collect by studying the course of architecture in other places.

He would like to point out that Mr. Blomfield had not been kind to them. He was one of the four leading architects who came down, and whom they were very pleased to see. He ought not to have said in his letter to the "Times" that this examination was to be an alternative to apprenticeship. They gave Mr. Blomfield and the other gentlemen an outline of what some of them thought was possible. It was this—that they should have a preliminary examination here which might perhaps be accepted as equivalent to the preliminary examination of the Royal Institute of British Architects.

A Scientific Groundwork.

They thought that at Cambridge they had the means of giving instruction in the scientific groundwork of architectural science, just as they had the means of giving preliminary instruction to their young doctors. The students would go to London or elsewhere and enter the offices of architects for at least two years to learn the practical part of their work and then they would be re-examined, not by amateurs at Cambridge, as Mr. Blomfield had said, but by the best architects in the Kingdom, just as for their medical degrees they had the best surgeons and physicians to examine the men who were to be doctors. That was the scheme they had in view for the Diploma of the University, and he stood by it. The contention set forth in the "Times" by the three architects in effect amounted to this: "We don't want you at Cambridge to have such a thing as a School of Architecture." What was the cause of this opposition? Why did they object to Cambridge? They said that the real thing was the training of the imagination of the architect. Well, had London, or Liverpool and Manchester, whose examinations in architecture are accepted, the exact environment that would enable a young man to have his architectural imagination developed? Was it to be acquired by gazing on the Hotel Cecil, the great factories in Manchester, or the dock buildings in Liverpool? At Cambridge a young man could get a liberal education, and whilst he was studying subjects which would be of advantage to him as an architect, his liberal education would still be going on, for he would be associating with his fellow students who were working at other forms of knowledge.

Again, at Cambridge he would have types of all classes of architecture, from the Saxon tower of St. Benet's down to the most modern abomination. In King's Chapel, with its wonderful roof, and in their long range of college buildings, there was the most perfect training ground they could possibly desire for the young man who desired to have his imagination stirred. That was the real answer to the only real objection urged in the correspondence in the "Times" against Cambridge having a School of Architecture.

One word more as to the new movement in architectural education. These gentlemen (Messrs. Jackson, Blomfield, and Champneys) in their letter spoke as if architects were altogether united in their profession. When they came to look into the matter they found that for sixty years architects had been trying to shake themselves together and to do something to reform themselves, and it was only, he believed, within a very short time that Mr. Blomfield had been induced to join the Institute. He was one of the people who stood out, and he (Prof. Ridgeway) thought they would find a good many leading architects who still would have nothing to say to the Institute. The architects were all to pieces. Mr. Blomfield told them there was no such thing as a Science of Architecture. A great many of them had, for some time, realised that, those of them who had experience of smoky chimneys and discomforts of that sort. Well, it had occurred to them that the sooner Cambridge tried to put things on a scientific basis the better.

No Lowering of the Standard.

It was said they were going to lower the standard. They said—No; and in their report they were very precise in expressing their idea that they should have a very high standard in all that they did for architecture. The architects had done very little for themselves. They had, at last, drawn up some scheme of their own, but it was not of a very high order, and some of them did not like the idea of their own diploma at all. Architecture, as a profession, was in chaos. Here was the statement made by Mr. Blomfield and his colleagues: "Architecture is a fine art. You can no more teach men architecture than you can teach them painting or sculpture." Architecture was not one of the fine arts—purely a luxury, like painting and sculpture. Humanity had managed to live without painting or sculpture, but humanity had not been able to live without houses. It was the duty of an institution like their University to lay down the highest standard within its power, not merely for the men who were going to build great houses, palaces for Kings, or cathedrals, but also for the men who would build the ordinary houses which artisans and labourers had to live in. They wanted to rectify the present condition of things under which any man could come there, go to King's Parade, hire a room in a house and put out a brass plate declaring that he was an architect and surveyor. Such a man could practice without hindrance. The poor deluded public went to him and had to suffer for it. He himself (Prof. Ridgeway) might put over his rooms in Caius College that he was an architect and take in the public, and there were worse men

than he doing it! It was a state of things that should not be. But the great architects in London would do nothing to remedy that, and said that they did not want a diploma, and that each man must establish his own position. It was all very well for those great men to assume that position, but what they wanted was something to prevent the public from being gulled, and, what was more, they wanted something that should raise the level of architecture in the land. They wanted to ensure that the architect had been given a sound training, that he had been so taught as to be able to build a house that would not tumble down, chimneys that would not smoke, and so on, and that he should not be a real fraud to the unfortunate person who employed him to build a house. The whole science of architecture was in a bad way, not only with regard to the artistic side, but on the professional side, in providing ordinary houses for the public. If Cambridge would only take the matter into her own hands, if she would not listen to what those architects said outside, but would make up her mind to undertake the education of architects for herself, and by herself, with a high idea of the standard she would exact in the various tests she would impose, they would be on their way to the Diploma, and the Cambridge Diploma would not simply be a great benefit to herself and her students, but in a very short time it would raise the whole level of architecture, and in consequence, raise the level of the highest form of architecture in the Kingdom.

Professor Waldstein's Opinion.

Dr. Waldstein thought that if it were at all desirable that architecture should be encouraged as a study in the University, Cambridge would insist upon maintaining the very highest standard. He had no doubt, could they do what Professor Ridgeway recommended them to do, it would be for the good of the country, and he hoped it was still possible they might some day lead the way in imposing the highest standard in architecture, as he believed they had already successfully done in other studies, such as medicine. But for the present moment they must be modest. They must try to make use of the means they had at their disposal, and that limited them for the present to teaching in the admirable school of engineering and mechanical sciences which they had at Cambridge, and to teaching the more theoretical aspects of art and architecture for a special examination. But by doing that he did not see how they in any way deprived themselves of the opportunity of some day establishing at Cambridge a great School of Architecture with high aims and good results such as Professor Ridgeway had foreshadowed for them.

Mr. Cranage had a word to say as to Mr. Blomfield's opinions, quoted in the "Times." He did not wish to enter into a discussion of the point, as Mr. Blomfield was not there, but he thought it was only fair the Senate should be told that Mr. Blomfield was one of those who signed the answers to questions sent by the syndicate to representatives of the Royal Institute of British Architects. The first question they put to them was this: "Is it desirable to teach architecture in any form in the University of Cambridge?"; and the answer sent by Mr. Blomfield and others was—"We think some instruction in architecture might be taken in the third year as a special subject for a pass degree."

Of course everyone agreed that if Cambridge started a diploma at all it must be one of the highest standard. The highest standard by far that they were able to learn about in architecture was that of the Ecole des Beaux Arts in Paris. The requirements for that diploma were exceedingly high, and they felt that any diploma started by one of the two ancient universities in England would at once, in the minds of the architectural world, be compared with the Paris diploma. That diploma required two things which they had not got at Cambridge at present, first a great deal of money, and secondly, a great many expert teachers. Every one of them on the syndicate would be delighted if they had both these things with which they could endow a School of Architecture in Cambridge, but at present they had not got them. The alternative was to have an examination for which preparation would have to take place elsewhere.

NOTE.—The above extracts of portions of some of the speeches made during the course of the discussion are taken from the full report of the proceedings, which appeared in the Cambridge University "Reporter" of February 11th.

Notes on Competitions.

A World-Memorial to Shakespeare.

A proposal is on foot for raising £200,000 for a world-memorial to Shakespeare, half of that amount to be expended on an architectural monument, with statue, to be erected in Park Crescent, Portland Place, London, and the remainder to be devoted to some international purpose, "in furtherance of Shakespeare's aims." The advisory committee in charge of the matter (included on which are Sir Aston Webb, Mr. John Belcher, and Mr. Thomas Brock) recommend the holding of a competition for the memorial, open to English-speaking races all over the world. They further recommend that each design be submitted by a sculptor and an architect in collaboration; that the competition be in two divisions, the first consisting of sketch designs on a small scale, and the second to be limited to six competitors selected from the preliminary competition, who would each receive an honorarium, and work out their designs on a larger scale and more in detail; that the sketch designs be submitted not later than July 31st next, and the final designs not later than February 28th, 1909; and that the authors of the designs selected by the committee of selection be employed to execute the work.

Royal Grammar School, Colchester.

The awards in this competition are as follows:—1st, Messrs. Newman, Jacques and Round, of 2, Fen Court, Fenchurch Street, London, E.C.; 2nd, Messrs. Spalding and Spalding, of London, E.C.; 3rd, Messrs. Goodey and Cressall, of Colchester. Mr. T. G. Jackson, R.A., was the assessor. The designs submitted (seventeen in number) were exhibited at Colchester Town Hall on Monday and Tuesday this week. The school is estimated to cost about £15,000.

Town Hall, Radcliffe, Manchester.

Fifty-four designs were submitted in the competition for this new building, which is estimated to cost £12,000. The awards are as follows:—1st, Mr. W. M. Gillon, of 66, Deansgate, Manchester; 2nd, Mr. D. Bird, of Manchester; 3rd, Mr. H. Lord, of Manchester; 4th, Messrs. Gilling and Moorhouse, of Liverpool. The assessor was Mr. G. H. Willoughby, F.R.I.B.A.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.		COMPETITION.
Mar.	13	SCHOOL AT FISHPONDS, BRISTOL, for 600 children. Limited to Bristol architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May	23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon, up to March 21st.
May	31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June	1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport.

MODERN SANITATION.

A considerable amount of work has lately been carried out at the Army and Navy Club, Pall Mall, London, S.W., under the direction of Mr. Edward Greenop, A.R.I.B.A., not the least important part being the reconstruction of the drainage system.

The stoneware drains put in 30 years ago were found to be unreliable, and these have been taken out and an entirely new system of cast-iron drains has been installed.

In dealing with the re-draining of an old building, the use of which may be compared to that of a busy hotel, many difficulties have to be met, especially with regard to the ventilation of the system. This has been so arranged that no part is without a draught of fresh air and yet no vent pipes disfigure either of the two front elevations of the club.

The inspection chambers are of the sealed-down type, with lever-locked air-tight covers made by the North British Plumbing Co. The advantages of these are that they are easily and quickly removed and replaced for the purposes of inspection and cleansing, with no bolts to be lost or broken in the operation.

The periodical flushing of the drains is provided for by automatic flushing cisterns, so placed as to cleanse the grease traps receiving the sink wastes.

For the purpose of cleansing the floor of the kitchen, special double-seated gulleys, with under-covers secured by thumb-screws, but without loose parts and easily removable, have been provided.

Much of the sanitary plumbing was also dealt with, and obsolete types of fittings replaced with modern arrangements.

The work was carried out by the North British Plumbing Co., Ltd., of Westminster.

A NEW BOOK ON SEWAGE DISPOSAL.—Messrs. Archibald Constable and Co. are preparing for immediate publication an important work on "The Design, Construction and Maintenance of Sewage Disposal Works, being a Practical Guide to Modern Methods of Sewage Disposal," by Mr. Hugh P. Raikes, A.M.I.C.E., F.S.I. For the past fifteen years Mr. Raikes has been engaged in the collection and classification of a large mass of valuable information, and the results are embodied in this volume.

TUITION BY CORRESPONDENCE.

The system of teaching technical subjects by correspondence has come greatly into favour in this country, although it is of somewhat recent growth, while in other countries, particularly in the United States, such instruction has been found of very great service for many years past, and is a most popular method of gaining knowledge. The system has many advantages. It enables those who are engaged in business to acquire either a full course of instruction in the subjects which they are engaged in dealing with during the day, or in any other subject they may be interested in, or may desire to make use of as a business or a profession. Students in country districts cannot find the opportunity of attending a proper school for personal instruction, and for them the correspondence school is of great importance. But there are also many in town, engaged in business, who, for various reasons, have not the opportunity of attending for personal instruction, and these again find the system has its advantages. In addition, there is another great feature in the results obtained by the correspondence method of instruction, namely, that students have to use their own efforts to master the information, and the instruction is more allied to that given to elementary students in the shape of home work, which has been recognised as making the student think for himself and grasp the matter better than class work, when, more often than not, the information goes in at one ear and out at the other.

We have recently had the opportunity of investigating the methods of the International Correspondence School, 57, Chancery Lane, W.C., which is conducted under English management as a branch of the International Text Book Co. of the United States. This school conveys its instruction by means of text-books, which the student can digest at leisure, and test his knowledge and progress by answering questions set at the end of each chapter, sending his answers to the offices of the school, where they are corrected and returned with advice. The student, upon payment of very moderate fees, receives several bound volumes of books, with sections bound separately in pamphlet form. These pamphlets are more convenient for systematic study, and prevent the larger copies from becoming soiled through continual use; the cost of these duplicates therefore is well repaid. The bound volumes form most useful treatises on the subjects with which they deal, and are very valuable for reference. We have had the privilege of going through the series of volumes upon such subjects as more particularly concern us, and we have nothing but praise for them. The information is conveyed in a most succinct form.

The text-books have been compiled by experts in the particular subjects, and the students' answers to the questions set are corrected by competent examiners. Every endeavour is made to keep the text-books up-to-date, and it is remarkable to find how reliable they are in this respect. Of course we could wish for some of the subjects to be treated in greater detail, but for the ordinary student perhaps the general amount of information is sufficient. In the more specialised subjects there are separate courses, which are very thorough.

It is remarkable how quickly students improve in draughtsmanship under correspondence tuition: it seems almost as if this were the most difficult thing to teach by correspondence, and that good results could not be obtained, but facts speak for themselves, and it has been proved to us that the opposite is the case.

Useful prospectuses are issued by the International Correspondence School, in which much information is offered as to the prospects in the various professions and trades, the examinations of the various societies and institutions, syllabuses of the courses, etc. Architecture, building construction, land surveying, architectural drawing and designing, plumbing, heating and ventilation, and civil engineering are the subjects of the special courses in which we are more particularly interested, but there are a great many courses which some of our readers may be interested in, and they will find very few subjects that have not been dealt with by the International Correspondence School.

An exhibition in connection with the school is now open at Arbitration Room No. 12, at the Safe Deposit Buildings, Chancery Lane, W.C., where the system of tuition by correspondence is fully demonstrated.

A SHORT BIOGRAPHY OF WREN.

Wren was born on October 20th, 1632, at East Knoyle, in Wiltshire, a small village of which his father was rector. A very weak boy, at the age of 9 he was

SIR CHRISTOPHER WREN.

sent to Westminster School, proceeding thence to Oxford, where he soon became known as a scientific prodigy. But he was not allowed to enjoy college life very long. At the age of 25 he was offered and accepted the Chair of Astronomy at Gresham College, London. His future was now assured. It is as the architect, however, that we know Wren, not as the scientist. And so it happened that before he was 40 years of age he threw up his professorship and concentrated all his great mind on architecture.

Wren did not miss his opportunity. The Great Fire of London had raged from September 2nd to the 8th. Four days afterwards, on the 12th, Wren was granted an audience of the King, and laid before him a complete design for the rebuilding of the City, a copy of which may be seen at All Souls', Oxford, to-day. But magnificent as was the scheme, and much as the good citizens of London admired it, the enormous expense of carrying out the design cut short their enthusiasm. Wren, however, was nothing if not practical. As he was not permitted to rebuild London, he would turn his energies to a less ambitious occupation. There were 36 of the Companies' halls in ashes, 50 parish churches, to say nothing of private houses, Government buildings, and last, but by no means least, the City Cathedral itself. Here was scope and enough for his architectural genius; he submitted his plans, only asking the modest remuneration of £300 a year. His offer was accepted; he commenced his great work shortly afterwards, with the title of "Surveyor-General and Principal Architect for Rebuilding the Whole City."

As to his designs for the smaller edifices, there was little or no objection. It was round St. Paul's that the battle of criticism raged fiercest. In 1668 he had submitted his design for the new Cathedral to the Dean and Chapter. Two years later the Government interested itself in the matter, and by way of furthering the scheme assigned annually a portion of the coal tax then levied to meet the cost of construction. The demolition of the old building took nearly three years to complete. It was a precarious undertaking; but, with the help of gunpowder and a battering ram, the last stone was at length laid low, and Wren submitted his design for the new Cathedral to the King. The model of this first design may be seen in St. Paul's to-day. But fine as was the conception, it was rejected owing to its "unecclesiastical" character. The indomitable spirit of the architect triumphed, however; he submitted a second plan, which, being accepted, he was authorised to carry out and finish "by parts." Forty-one years after the commencement of the work St. Paul's was finished. All through the Stuart and subsequent reigns Wren's position was unchallenged. On the accession of the Hanovers, however, Court jealousies were too much for him. For four years he held his own, but in 1718 (so well had his enemies succeeded in their designs) he was dismissed from the post of Surveyor-General, and one William Benson was appointed in his place.

Wren now practically retired from business, though he still retained his supervision of Westminster Abbey. Hitherto he had spent his time between St. James' Street, where he had a house, and Hampton Court. He now lived almost entirely at the latter place, coming up to London as duty necessitated. It was on one of these journeys that he caught a chill. He was a great age, being over 90, though his strength and faculties were well maintained. Nevertheless, he gradually got worse, and after a few weeks' illness he died on February 25th, 1723.—Extracted from an article in the "Globe."

A VOLUME ON PORTUGUESE ARCHITECTURE, by Mr. W. Crum Watson, of Edinburgh, is being published by Messrs. Archibald Constable and Co. It contains about 100 photographic illustrations, as well as two coloured plates of wall tiles, a map, and numerous plans.

* * *

CHIEF ARCHITECT FOR MONMOUTHSHIRE.—The Monmouthshire Sites and Buildings Committee, which has in the past distributed its architectural work among various architects in the district, decided recently to recommend the parent authority to appoint a chief architect at a salary of £350, rising to £400, and an assistant architect at a salary of £140, rising to £200.

FIRE-RESISTING CONSTRUCTION SECTION.

(MONTHLY).

CUBIC CONTENTS OF BUILDINGS IN LONDON.

The subject of the cubic contents of buildings in London will shortly come before Parliament, and we understand that two petitions have been lodged against the measure as proposed. The opposition is not so much against the principle of larger cubic contents as against the absence of definite conditions and the unsatisfactory proposals for administration.

It is certainly most unwise that the proposed important changes should have been hidden in a General Powers Bill of the London County Council, and that the whole question of cubic contents should ever be made the subject of the whim of those in power in the L.C.C.

The conditions and the maximum of cubic contents possible should be specifically laid down by Act of Parliament as are all the other important restrictions for building in the Metropolis. Discretionary powers should only be allowed on quite minor matters of detail. To allow the question of cubic extent to be dependent upon whether the public authority be in a "panic-y" mood or not is ridiculous. After several large fires it would be difficult to obtain a large cubic extent. If there be no fires of great importance for a year, buildings of most unwise cubic extent would probably be allowed, possibly to the extent of three or four millions of cubic feet.

It should also be remembered that in those countries which do to-day allow large cubic extent, the conditions are most exacting, and that those countries have the Code Napoleon, or its equivalent, in force, by which the owners of the premises which catch fire became responsible for the loss occasioned to adjoining owners, neighbours, etc., which makes them far more careful both as to their building construction and the separation of their buildings from adjoining property than is the case where there is no responsibility of this description.

Thus there should certainly be a limit to the cubic extent by Act of Parliament, and, as before suggested, we have thought that two million cubic feet would be a reasonable limit for any one compartment in a building, as against the present maximum of 450,000 cubic feet.

We are somewhat surprised to observe that the Royal Institute of British Architects is not taking an active part in obtaining a clear definition in this proposed radical change of the conditions of building in the Metropolis, but we assume that, as in the case of several other societies, the cost of appearing before the Committee of the House of Commons has weighed with the Council.

We are pleased to observe that the District Surveyors' Association has lodged a petition, as the district surveyors have to administrate the Act of Statutory Officers, and their position in the matter as now proposed would be most difficult, and would lead to constant disputes.

Most remarkable, however, in the whole matter of these cubic extent clauses as submitted to Parliament, is the fact that there is no right of appeal, and that the Tribunal of Appeal has been ignored.

Altogether the whole question of cubic extent is such a serious one for the safety of the Metropolis, and for its insurance rates, that it requires the closest possible attention.

We have it on good authority that the Fire Offices' Committee has sent its views to the London County Council, although not petitioning against the Bill. Their views expressed in £ s. d. will mean substantially higher block rates where there are buildings of excessive cubic content, not only for the actual owners of these big buildings, but also for the adjoining owners, and rightly so, for these big buildings constitute a danger which in many places has led to conflagrations.

Thus we wonder the Property Owners' Association is not alive to the trouble pending in increased rates if the clauses become law in the form they stand to-day.

FIRES IN SCHOOLS.

The recent calamity at Cleveland, U.S.A., where nearly 200 children lost their lives as the result of a fire in a school building, reminds us once more of the unfortunate state of the large majority of the school buildings in this country, so far as safety from fire is concerned.

We are, of course, fully aware that in new schools precautions have been taken, and that efforts have also been made to improve many of the older schools. But, to take London alone, we must always remember that some five hundred voluntary and other schools, when taken over by the education authorities, were in a lamentable condition, and we much doubt whether these buildings have all been brought up to modern ideas; while, in the country, where the state of some of these voluntary schools was as bad as possible, it is a notorious fact that in many instances absolutely nothing has been done, or even attempted, as yet, to remedy existing conditions.

Architects will do well to note that where they hold regular appointments under educational authorities it is their duty to put on record such criticisms as they may find it necessary to make concerning the safety of school buildings, and that a mere verbal mention to the chairman or some other officer of the public authority will not exempt them from blame when catastrophes arise, unless there is actual written proof that their criticisms have been received, though not acted upon.

In many cases, of course, the whole question of the safety of school buildings turns upon the question of expense, but there are certain minor inexpensive safeguards which could be dealt with immediately. Among these we would include the stipulation that all doors on to staircases, and from staircases to the outside, should open outwards; the provision of continuous suitable handrails on both sides of all staircases; and the rounding-off of dangerous angles on landings. When these little matters are dealt with systematically throughout the country, a great step in the right direction will have been taken.

TESTS WITH FIRE EXTINGUISHERS.

On Wednesday last some further tests with fire extinguishers were conducted by the British Fire Prevention Committee at their testing station at Regent's Park, the tests including a liquid fire extinguisher and a powder fire extinguisher.

The further these investigations progress, the clearer the necessity for them becomes, for there cannot be the slightest doubt that the spectacular tests so frequently conducted by makers give no true representation of the efficiency and the limitations of these appliances.

Each appliance, no doubt, has certain advantages, but also disadvantages, and the opinion is frequently forced upon one that the appliances should be selected according to the class of property in which they are to be used, and that in certain cases even two forms of appliances might advisably be installed. This is a point which architects should bear in mind, as they frequently have to specify such appliances.

In some large warehouse, factory or hotel, where there is a trained staff who practise with the appliances available, more complicated apparatus is permissible than in the private household or shop where some occasional assistant or domestic servant may be called upon to suddenly use the appliance without any previous knowledge of its peculiarities.

Again, whilst certain liquid appliances may be eminently useful for dealing with small fires comprising substantial materials, they would be quite useless for dealing with spirit or petrol; and certain powder extinguishers which may be of comparatively small value for substantial materials, may be found eminently effective for petrol and similar spirit.

Probably in no case were the different values of appliances so markedly visible as in the recent tests of the British Fire Prevention Committee. The reports on them should certainly be most instructive reading if compared, and, we trust, eventually tabulated.

The tests on Wednesday last were with the "Accurate" Fire Extinguisher (which is a liquid fire extinguisher, the appliances under test containing three gallons and two gallons respectively), and the "Diamond" Powder Extinguisher (a large number of tubes containing about two pints of material being examined in some thirty tests).

The tests with petrol were a particular feature of the latter tests, and were carried out in considerable detail. The results should be specially useful to architects in charge of the equipment of motor garages and the like.

The attendance at the tests was considerable, comprising chiefly public officials from the various Government and municipal authorities, and representatives from the insurance companies. The arrangements were in the hands of Mr. Edwin O. Sachs, F.R.S.(Ed.), Mr. Ellis Marsland and Mr. C. E. Goad on behalf of the Executive, and Mr. Percy Collins, J.P. (directing member), Mr. James Sheppard, Captains Dyer, Henderson and Folker as a special sub-committee in charge of the tests.

RENDERING MATERIALS NON-INFLAMMABLE.

An International Competition.

In connection with the International Exhibition which is to be held at Turin in 1911, a competition is being promoted with a view to obtaining suitable methods for rendering materials non-inflammable.

The exhibition is under Government patronage, and its organisation should be much on the lines of the Milan Exhibition of 1906.

We give below a rough translation from the Italian as to the conditions.

The Executive Commission of the International Exhibition of Industries and Labour, to be held in Turin in 1911, having in mind the heavy damages inflicted by fire at some previous exhibitions, has organised a competition among such persons as can supply material which will render timber and textiles "fireproof," or at least non-inflammable. The competition regulations are as follows:—

(1). The proposed materials will be divided into two sections, according to their application to timber or to fabrics.

For timber a speedy and cheap method of superficial coating will be preferred, but other processes will not be excluded. The coating material must permit any polychromatic decoration.

For textile articles, intended to be solely of vegetable fibre, the application of the stuff, either on yarn or on undyed or dyed fabrics, is left optional, provided the strength, suppleness and colouring of the materials are not altered.

(2). Materials must be forwarded prepaid before the end of 1908 to the Direzione del Laboratorio di Chimica Docimastica del Regio Politecnico di Torino, in quantity sufficient to protect at least fifty square metres of timber surface or fabrics. Materials not received by the time above stated will be excluded from competition.

The Executive Commission is entitled to purchase material judged worthy of award in a sufficient quantity for all the exhibition buildings. Competitors, therefore, are to enclose a note stating the quantity they can pledge themselves to supply, and the price delivered at Turin. The competitor must also give written directions for applying the material in trials, and the tests for same in case the order eventually be awarded to him.

(3). The jury appointed by the Executive Committee of the exhibition will judge the material submitted to them promptly and without appeal, in a technical, practical, and economical manner, making all trials as they may think proper.

Competitors are at liberty to attend the trials, either personally or by proxy.

(4). The jury will have at their disposal two gold medals and two silver medals, presented by the Società Promotrice dell'Industria Nazionale. These are to be the first and second prizes in each of the two sections of the competition, and a sum of 4,000 lire to be distributed among the winners of the competition and those considered worthy of awards in consideration of recent researches made or noteworthy results obtained.

FIRE AT THEATRE ROYAL, WINDSOR: VIEW FROM STAGE.

VACANCY FOR NEW OFFICER, LONDON FIRE BRIGADE.

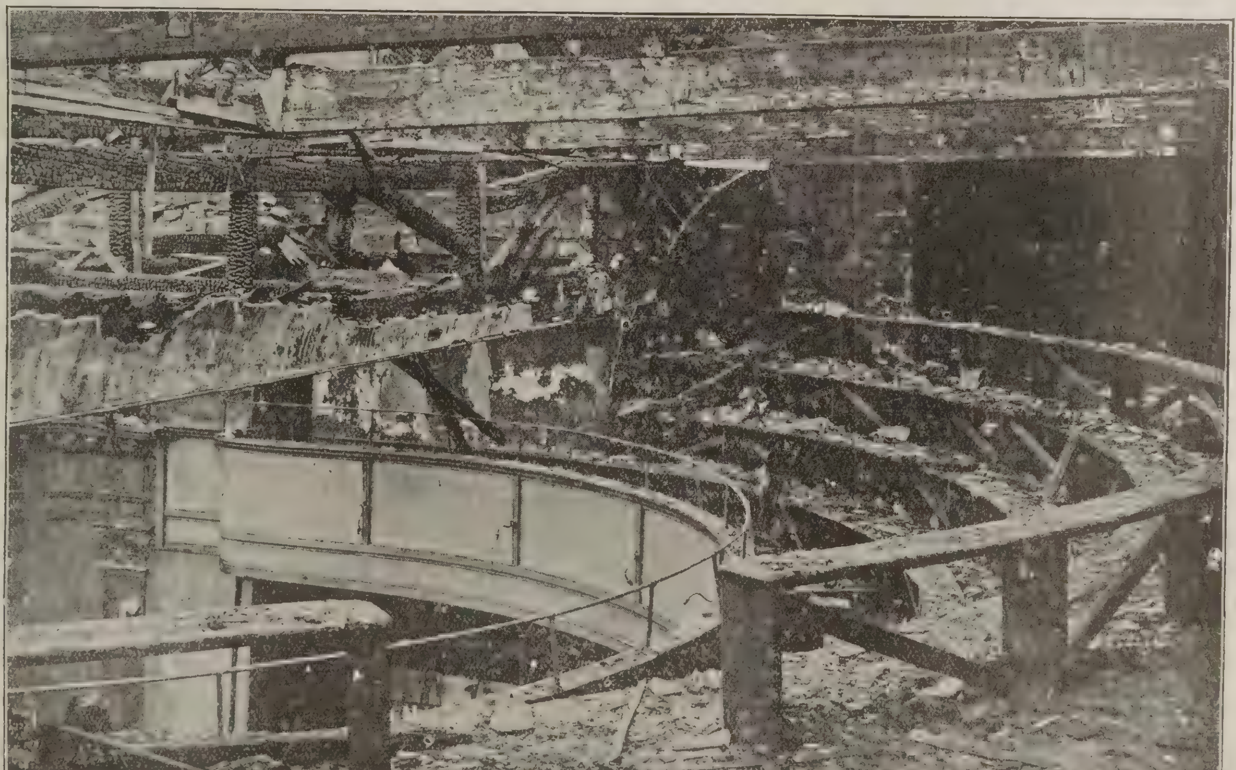
We notice that an appointment will be open in the London Fire Brigade for an officer with the commencing salary of £300 and quarters. It is practically open to all comers, but we have little doubt that, with the increasing importance of building construction in the routine work of the brigade's officers, a young architect or surveyor would stand a good chance, particularly if he also had some experience in handling men, as a volunteer or otherwise. The duties are such as should be of much interest to the young architect or surveyor, particularly if trained on what might be termed the practical or scientific side. There is a considerable amount of survey service to be done, examination and passing of plans, application of the Building Act, and similar regulations, besides the actual administrative and fire duties, so that the work is of the variation an active man should desire. Particulars of the appointment can be obtained from the Clerk of the London County Council.

WINDSOR THEATRE FIRE.

We give in this issue some views of the Theatre Royal, Windsor, which was gutted by fire on February 18th. The outbreak was first discovered about 4.30 a.m. Its origin has not been discovered, but it is known to have broken out from the stage. The whole of this portion of the building was destroyed, as well as the roof and the upper part of the gallery; but a large portion of the auditorium, including the pit, dress circle, upper circle, bars, and cloak-rooms, was saved by the lowering of the "fireproof" curtain, which, with the iron division doors, cut off the flames. The theatre is situated at the bottom of Thames Street, beneath the very walls of Windsor Castle, and was originally built in 1815, but during the last few years it has been remodelled and improved. Notwithstanding this fact, however, the whole of the back of the building was destroyed, though the firemen prevented the blaze from spreading to the adjoining buildings. The property was fully insured. The curtain was of two layers of asbestos cloth on a metal frame, and constructed in two parts.

Glasgow Institute of Architects.—The annual general meeting of the Glasgow Institute of Architects was held on Wednesday last, Mr. James Monro, F.R.I.B.A., president, in the chair. The annual report stated that by the new constitution the membership has been increased by 87 members of the late Glasgow Architectural Association.

General View from Above. *Photo: Watford Engraving Co.*



View at Gallery Level.

Note: The fire in this theatre was arrested by a double asbestos "fireproof" curtain, which preserved the main part of the auditorium though the roof and the gallery were destroyed.

FIRE AT THEATRE ROYAL, WINDSOR, FEBRUARY 18th, 1908.

THE PROTECTION OF CHURCHES AGAINST FIRE.*

By Chief Officer Diditius (Lubeck.)

On the subject of the protection of churches and towers or steeples against fire there is very little literature to be found, with one exception, namely, a book by Rudolf Fried, entitled "Church and Tower Fires: How to Combat Them, and to Prevent Them" ("Kirchen-und Turmbrande deren Bekaempfungeund Verhuetung"). This publication appeared in the journal "Feuerloeschwesen," published by Ph. L. Jung, of Munich. I can highly recommend the book, having, in fact, based my own treatment of the subject on similar lines.

It is not only the immediate danger to the surrounding neighbourhood which calls for the consideration of the question of the protection of churches against fire, but the necessity of protecting churches as a whole. Churches and other places of worship serve for the assembly of large numbers of people, and, therefore, the same rules should apply to them as to places of entertainment and assembly, and it is not so much the question of burning which comes into consideration, but the panic that is likely to ensue when large numbers of people are gathered together.

The Dangers in an Old Building.

Let us for a moment enter one of those large mediæval churches. In general we shall find that there is little in the actual church which would help a rapid spread of fire. Nevertheless, we encounter numerous wooden structures built within the fabric, which, if a fire broke out, would give it ample food for spreading. Frequently the danger is increased through inflammable materials used in the decoration of the church. Thus, even in a very large church, many difficulties can arise in case of fire. Let us leave the floor of the church and ascend to the loft. This is often a place known only to those intimate with the structure. It is usually narrow, constructed of wood, and approached by a winding wooden staircase. At some point on this staircase a passage branches off to the organ loft, which is partly into the tower. In order to enable the organist to read his music when the church is darkened for service, he is supplied with open candles, or even paraffin lamps. Similar lights are also supplied to those working the organ bellows, which lights are frequently placed on some beam or girder to which the wooden wall of the organ is attached. There is no safe partition between the organ room and the tower, nor between the organ loft and the stairs leading thereto. Let us ascend these stairs further, and we shall find that they terminate in the tower, or in the roof over the nave. In this latter we are overwhelmed by the quantity of woodwork; it might be described as a forest of wood, thoroughly dry and covered with the "dust of ages," and, consequently, highly inflammable. Moreover, the roof space is filled with all manner of material that would be fuel to a fire, as well as numerous openings that would draw the flames, once started.

Let us return to the tower. Here we find some strange arrangements, half ladder, half staircase, which bring us into the steeple, where the bells are fastened to huge beams of wood, and kept well oiled, so that they may turn easily. But, unfortunately, the oil used to lubricate the bearings of the bells runs down the woodwork, and thus we have further food for the fire. And as we ascend into the construction we find the same features, the woodwork becoming denser and denser until at last it is impossible for one to go further. We peep through the uppermost opening, and note with pleasure that a lightning conductor has been fixed to the roof of the tower. Our sense of satisfaction, however, becomes somewhat damped when we find that this lightning conductor is not in working order, and, later, when we learn that no tests have been made on the same for thirty years past.

I know full well that in many places things are not so bad as I have indicated, especially when the church administration and the fire brigade take an interest in the fabric. But I have purposely touched on every possible fault in order to have a basis for laying down some rules for the prevention of fire.

Churches built of stone, with roof supports of iron, and towers of massive construction, are not considered dangerous, assuming there are no other unfavourable conditions. But I also have in mind the churches of the 17th and 18th centuries, which often had no massive dome, as was the case with the Kreuzkirche in Dresden, and the Michaeliskirche in Hamburg, where, if a fire broke out in the roof, it must needs lead to the entire destruction of the church. Even new churches often exhibit such a neglect of all measures of safety against fire that one can scarce suppress astonishment.

From what has been said it will be possible to enumerate a few rules.

Protection Against Lightning.

In the case of churches, danger from lightning is considerable, owing to their extreme height. The precautionary measures are as follows:—

1. Good conductors and efficient connections to earth.
2. A sufficient number of forks connected with one another by metal connections. The division of the lightning flash into a number of separate systems is a mistake, as in the case of resistance in one of the conductors the flash is turned off on to other conductors, and may strike on its way.
3. Metal in any large amount in the towers and in the church proper, even heating pipes, water pipes, iron roofs, etc., should be connected to the lightning conductors. Where bells are attached to wooden supports the connection is not necessary, if the conductor on the tower is an efficient one.
4. The use of a metal covering-in of the tower for conducting off the lightning is not always advisable, as if the joints between the single metal parts become loosened the connection is disturbed. It is safer also, in the case of metal roofs, if one of the forks of the conductor at the uppermost point of the tower over the tower roof is specially strengthened.
5. Good connections to earth can be made through water pipes, and, in certain circumstances, even to gaspipes, where ground plates cannot be embedded, i.e., in the case of soil which is always damp.
6. The conductors should be tested regularly, at least every spring.

Protection Against Fire from Without.

1. Do away with all exterior woodwork which cannot be easily reached, or protect it with non-inflammable materials.
2. Protect the roof floor, turret windows and other openings by means of wire guards of a close mesh, or replace ordinary glass panes by wire glass. Close up the larger openings with metal shutters, or shutters covered with metal.

Precautions Against Outbreak of Fire.

1. No open lights or fires should be permitted; no smoking should be allowed in any part of the church.
2. The use of paraffin or other easily-explosive lighting materials should be prohibited.
3. Instructions should be given that the utmost caution be used when any building alterations are in progress, especially plumbing work; in the latter case a good supply of water should always be handy; further, when any soldering has to be done, fireproof plates should be laid under the soldering ovens, etc. Benzine and spirit lamps should not be allowed. In all cases where repair works necessitate the use of fire, special rules should be laid down.
4. A regular inspection should be made of the gas installation, the electrical installation, and the heating installation, as well as all fireplaces and chimneys. Inflammable material for the isolation of the heating pipes should be prohibited.
5. No unnecessary inflammable material should be tolerated in any part of the church—birds' nests, receptacles for paper, etc., should be eliminated.

Measures to Prevent the Spread of Fire.

1. Division of the different parts by fire-resisting walls, especially proper division between the towers and the church roof by means of thick walls and fire-resisting doors; the organ should be cut off from the tower space.
2. The division of extensive church lofts by cross walls.
3. Necessary sprinkler installation, buckets, or other extinguishers. The water receptacles should be kept filled. All receptacles should be protected against frost, or should be salted when there is frost. A regular testing of all appliances should be insisted on.
4. Where possible, hydrants should be fitted in the loft and high up into the tower. These pipes should be under sufficient pressure so as to enable jets to be sent to a good height.

General Precautionary Measures.

1. Easy access to all parts of the church—to the roof, towers, etc. All roof floors should be accessible at either end. Bad stairs should be replaced by good ones, or by ladders. Handrails should be put in dangerous places.
2. Churches should be regularly inspected by the fire brigade for the purpose of pointing out any defects, so that they may be remedied, and also to enable the members of the brigade to become acquainted with the structure and its intricacies.

*Translation of a paper read before the German Professional Fire Brigades' Association.

THE NEW VICTORIAN GOVERNMENT OFFICES are now being erected on a portion of the "island" site in the Strand. The contractors are Messrs. J. Carmichael and Co., of Wandsworth, who have undertaken to complete the work in 46 weeks from the date of commencement. Mr. Alfred Burr, F.R.I.B.A., is the architect.

* * *

REREDOS FOR NEW CHAPEL IN ST. PAUL'S CATHEDRAL.—The Chapel Committee of the Order of St. Michael and St. George met in the chapel of the Order in St. Paul's Cathedral recently to consider designs for a reredos submitted by Mr. Mervyn Macartney, the cathedral architect. The scale of the designs was regarded as too large for the funds in hand, and simpler plans were asked for which might be enlarged later.

View on First Floor.

View from Eleventh Floor.

FIRE AT THE PARKER BUILDING, NEW YORK.

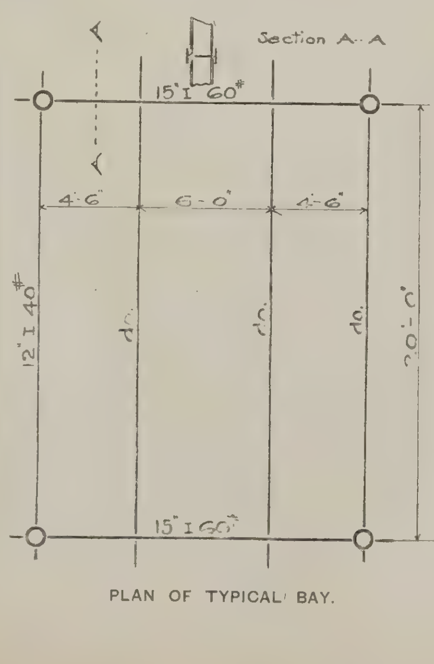
THE PARKER BUILDING FIRE, NEW YORK.

On January 10th this year a fire occurred in the Parker Building, at the corner of Nineteenth Street and Fourth Avenue, New York, resulting in great loss, both of property and life; and as the building was of so-called "fireproof" construction it is interesting to investigate the causes and effects of the fire, for, as our contemporary, the "American Architect," points out in this connection: "While architects and engineers may be interested to a limited extent in the origin of a fire in a modern skeleton frame building, especially if there is a suspicion that it may have originated from defective electrical installation, improperly constructed flues, or other faulty details of the mechanical equipment, for the successful and safe operation of which they feel in a measure responsible, their chief interest from a professional standpoint is in studying the effects of the fire, and endeavouring to account for them in a manner compatible with their preconceived theories of fireproof construction."

The Parker Building was constructed in 1899 under the old building law, before the requirements of fire-resisting construction were understood as well as they have been since the Baltimore conflagration. It was of steel skeleton construction, with brick and terra-cotta curtain walls: Columns, cast-iron; girders, single I-beams, 60lb., 15ft. long; beams, 12in., 40lbs., 20ft. long. Each bay was divided in three panels, two of 4ft. 6in. spans and the centre one of 6ft. span. Beams were framed into the girders, the centre of the beam being on the centre of the girder, leaving the bottom flange of the beam 1½in. above the bottom flange of the girders.

The floor arches throughout were 8in. semi-porous, side construction, hollow tile arches, with lip skewbacks projecting 1½in. below the lower flanges of beams. There was no girder covering used. The soffit of the arches being 1½in. below the flanges of the beams, the underside of the arches was flush with the bottom flange of the girder, so the plastering was carried level across the flanges of the girders without metal lath to hold plastering in place.

All fireproof partitions were of 3in. hollow tile blocks. The circular cast-iron columns were encased in 2in. porous terra-cotta column covering. On top of the floor arches there was a very thin covering of cinder concrete.



PLAN OF TYPICAL BAY.

Mr. P. H. Bevier, engineer, reports as follows on the present condition of the building:—"The brick wall and terra-cotta on the Fourth Avenue side seem practically uninjured. There is some damage to terra-cotta lintels on the Nineteenth Street side. The floor arches where standing are apparently in good condition, with probably 5 per cent. of the blocks damaged by fire and water. A number of arches have collapsed near the top of the building. In most cases the collapses were caused by heavy safes falling through the wood flooring as it burned away, upon the arch beneath, letting the safes fall through, with the blocks, to the floor below. In most every instance collapsed arches were in the 6ft. span. I believe in no case were there any 4ft. 6in. spans collapsed except where falling safes or printing presses caused damage. The cast-iron columns were still standing and appeared in perfect condition. The column covering is intact, except where injured by falling material. Two sections of the building have collapsed: one from the roof to the cellar and one from the seventh to the eleventh floor. One of these collapses was caused by failure of a column, carrying with it the surrounding bay. The cause of the failure of this column is not known. The other failure was apparently caused by the falling in of the pent house on the roof, which was supported on unprotected columns, and when it fell carried several floors below. The openings caused by these failures provided a flue for the flames, and created intense heat on the surrounding arches. The girders being unprotected, were exposed to the direct heat, and in many cases deflected, causing failure of arches and falling of partitions which rested upon them."

The building was in no sense a type of modern first-class fire-resisting construction. The hollow tile arches were of good material, but 8in. arches should not have been used in 6ft. and 7ft. spans. The present building code of New York requires 12ins. Girders should have been protected by at least 2in. of fire-resisting material. Partitions in the upper storeys should have been at least 4in. thick, and should have had steel bucks instead of wood around the elevator and stairway. Many of the subdividing partitions were of wooden boards, others of wooden studs and metal lath, and some of plaster blocks, which are all down. Cinder concrete should have been of better quality. More attention should have been paid to the fireproofing of steel members carrying the roof construction.

Mr. Bevier points out that this building, with all its faults, is an example of the value of fire-resisting construction. Had it been built in any other way, the floors and walls would have collapsed and spread the fire to the surrounding buildings, and perhaps caused a disastrous conflagration.

As it is, however, in spite of lack of water, the fire did not spread beyond the building in which it originated, and the building itself is not so damaged but that it can be readily repaired and put in proper condition.

The "American Architect" endorses this opinion. Our contemporary says:—"Taken all in all, there seems to be no reason for any disappointment in the results of this fire, disastrous though it was. If the building had been built in accordance with the best practice, if the columns had been of steel and properly fire-proofed, if the girders had been protected, if floor arches of sufficient depth had been furnished, if partitions had been fireproof, if elevator shafts and stair halls had been closed and fireproof, if trim had been kalameined, and glass wired, if a sprinkler system had been installed and in working order, and then a disastrous fire had wrecked the building, even though the fire department had failed to render assistance, we would indeed be apprehensive as to the safety of our modern skyscrapers; but with all these things lacking in the Parker Building the results of a fire could not reasonably have been expected to prove less serious than our examination has shown them to be."

INDENTED STEEL BARS.

The following works in different parts of the country are now in course of construction in which "Indented" steel bars, supplied by the Patent Indented Steel Bar Co., reinforced concrete experts, are being used:—

Stadium: London.
Mavis Mill: Manchester.
Water Tower: Cleethorpes.
Warehouse Floors: Cambridge.
Warehouses: Manchester and Leeds.
Post Office: Milford Haven.
Bridge: Bath.
Strong-room: Teddington.
Telephone Office: North of Scotland.
Grammar School: Ashbourne.
Schools: Watford.
Post Office in the Midlands.
Dockyard Works: Devonport.
Tank: Yorkshire.
Swimming Baths: Sheffield.
Hoppers: Greenhithe.
Church Foundations: Ince.
Engine Sheds: Grangemouth
Military Store: Colchester.
Bridge: Sennowe Hall, Great Ryburgh.
Floors: Grimsby.
Engine Foundations: Cardiff.
Fence Posts: Grimsby.

These form a very interesting illustration of the diverse uses to which reinforced concrete can be put.

NOTES ON FIRE PROTECTION.

By Edwin O. Sachs, F.R.S. (Edin.), etc.

(Concluded from p. 148, No. 679.)

Fire-Brigade Organisation.

The organisation of professional fire brigades varies greatly. As to the hours of duty, there are brigades where officers and men are practically constantly ready to attend a fire, and others where they are ready on alternate days, two days out of every three, or three days out of every four, and the off day is entirely their own, or, at the most, only partially used by the authorities for some light work. The men off duty are only expected to attend a fire if there is a great emergency. The brigade is strong enough without them for ordinary eventualities. Both systems can be worked with or without retained (part-paid) or volunteer reserves, which would be only called out for large fires.

As to the primary training of a fire-brigade officer, the best men have generally had some experience in a technical profession, such as the scientific corps of the army or the engineering side of the navy, or the architectural and engineering professions, previous to their entering the fire service. Some brigades recruit from army officers only, and preferably from the Royal Engineers: others recruit from among architects and engineers, subject to their having at least had some military experience in the reserve forces or the volunteers. Some cities only take engineers or architects, and make a point of it that they should have had no previous military experience. Some previous experience in the handling of men is an advantage. Royal Engineers, and architects or engineers of some military experience have nearly always made the best fire-brigade officers.

As to the men, there are cities where only old soldiers are taken as firemen, others where the engines are manned by old sailors. In some towns the building trades supply the recruits; in others, all trades are either discriminately or indiscriminately represented. A combination from the army or navy on the one side and the building trades on the other is the most satisfactory. The knowledge of building construction in the ranks is of the utmost importance, and has often saved both lives and property. Where a brigade can boast of a few men of each important trade, much money has been saved the ratepayers by the men doing their own repairs and refitting, but the number of men from sedentary trades should not be excessive.

Equipment.

With regard to equipment, there are brigades which have all their sections or units provided with practically the same gear; others where each unit has a double or treble set, one of which is used according to circumstances. The section may have a chemical engine and a long ladder truck or escape at its disposal, and may turn out with either. Then there are towns where the units are differently equipped, and we find steamer or chemical engine sections called out, as the case may be. In a few extreme cases where the sections are very strong they may be equipped with a set of engines and traps, and the unit in every case turns out complete with, say, a chemical engine, a steamer, and a horsed escape. The contrast to this will be found in the small parties of twos or threes referred to whose turn-out would only consist of a small hose-cart or an escape.

Distribution of Stations.

In the distribution of stations, the formation of districts, etc., various systems have been adopted. The most satisfactory results have been obtained where a fully-equipped section (not simply a hose-car or escape party) can reach any building in the city within seven minutes from the time of the call reaching the station, the seven minutes including for both turn-out and run. Where there are exceptionally large or dangerous risks this time has had to be shortened to five minutes, and the possibility of an attendance from a second station assured within seven minutes. In dividing up districts, the most satisfactory results were obtained where every house could be reached from the district centre within fifteen minutes from the call. Headquarters would naturally have a central position in the city. In one or two instances headquarters' offices have been located in a separate building, which in no way served as a fire station, but simply as a centre through which all orders and business passed. This arrangement is not good.

The different stations must, of course, be in connection with each other. Headquarters should be in direct communication with every station; but every station should be able to communicate with its neighbour directly as well as through the headquarter's office, and there should be a direct wire to its district station if it has one. There should be three routes of communication, so that two would be always ready for use in case of one breaking down. Either headquarters or the district centres would be in touch with the various auxiliaries referred to, as well as the general telegraph office and the telephone exchange.

Fire Extinguishing Appliances.

Where there is a high-pressure water supply, some brigades simply attend with hose-reel, life-saving gear, and ladders, others turn out with chemical engines that carry a supply of water under pressure. No time is thus lost in connecting with the nearest hydrant or plug; and in case of a hydrant being out of order, there is always sufficient water at hand until the second hydrant has been found. Some cities always have an attendance of steamers which are, however, only used in urgent cases. In other instances the steamer is at once put into use, and this quite independent of the pressure there is in the water service. Where there is no good water service, steamers (or in minor brigades manual engines) have, of course, to be sent out, and are either supplied from the low-pressure service, or from the natural water-way or wells. There are still a large number of cities where the suburbs have no proper water service, and the old horsed water-tank or watering-cart comes in very handy here for porterage. Attempts have also been made to chemically treat water which is to be thrown on to the fire with the view of increasing its effect, or to use chemicals instead of water. These attempts should not be confused with the application of chemicals to supersede manual labour in chemical engines proper.

The selection of appliances must always be governed by local conditions and considerations. The stock appliances of makers are not necessarily applicable to every locality. For country brigades, for instance, such a detail as the width between wheels is of great importance, for the ruts in different districts vary on the country roads and field paths, and the wheel width suitable on the south coast

would not be suitable for Yorkshire. Quick steam raising is not a *sine qua non* in provincial centres or in the country. Large boiler capacity and great reliability are of more importance for the steam-fire engine in such districts than some of the showy qualities in which makers sometimes delight: in other words, a broad view of the general local requirements must be taken by those specifying appliances, and the makers' catalogues should not be slavishly followed, even if the alteration from the makers' standard types means some little extra expense.

Tactics.

Some brigades work as close as possible to the fire, others are satisfied with putting water on or about the fire from a distance. Some brigades carefully extinguish a fire, some simply swamp it. There are cases where officers will go so far as to let a roof that is alight burn itself out, simply keeping the surrounding walls or some attic floor damp. This prevents unnecessary water damage. The roof will have to be renewed in any case; what need is there to spoil a number of rooms below? Handled by judicious officers, several brigades have been able to boast of never having damaged property unnecessarily. They have, for instance, had the patience to suffocate a cellar fire, instead of putting the whole cellar under water. In certain classes of property the bucket, the mop, and the hand-pump have been far more effective in minimising actual destruction than the branch and hose. It is one of the easiest signs by which to judge the training and handling of a fire brigade to see what damage they do. Even an inconsiderate smashing of doors and windows, when there is absolutely no need for it, can be avoided, where every man in the force feels that his first duty is to prevent damage and loss, and his second to extinguish the fire.

Charges for Fire-Brigade Services in Country Districts.

According to the writings of Mr. Hugh Orton Smith, probably four-fifths at least of the fire brigades of England and Wales come under the heading of brigades the cost of which is borne within their district, but have the right to charge for services rendered outside it, these charges being regulated by sections 32 and 33 of the Towns Police Clauses Act, 1847. These sections have on various occasions been the subject of judicial decisions. Under section 32, the right of a local board to charge for the use of engine and appliances within the district to which they belonged was successfully contested in the case of *Drighlington Local Board* v. *Bower*. But this decision was not held to cover the question of the payment of firemen and other expenses incurred by a local authority in attending fires within its limits, this point not having been contested. A test case upon this latter issue was accordingly tried in the Widnes County Court, before His Honour Judge Shand, on May 24th, 1889. Under this case it is perfectly clear that a ratepayer is entitled to the services of the brigade, in respect of which he pays his rates, free of charge; in fact, such services have already, in a measure, been paid for out of the rates, and any further payment, in the nature of special charges, practically goes into the pockets of the ratepayers at large, whether insured or uninsured.

Charges for Services Rendered Outside the District.

As regards services outside the district, under section 33 "the Commissioners *may* send such engines with their appurtenances and the firemen, beyond the limits of the Special Act," and "the *owners of the lands or buildings*" where such fire shall have happened "shall defray the actual expenses, and shall also pay a reasonable charge for the use of such engines with their appurtenances and for the attendance of such firemen."

The meaning of the word "owner" under the section has on two occasions been a subject for the decision of the Courts. On the first occasion, in *Lewis v. Arnold*, it was decided by the Court of Queen's Bench that the occupier was liable. This ruling was, however, reversed in the case of *Sale v. Phillips*, a report of which appeared in the "Times" of January 25th, 1894.

It is a moot point whether a local authority, levying a rate in support of a fire brigade, may enter into a contract with the occupier, or person other than the owner, for payment of their charges for services outside the district. It is the known practice of one borough brigade to refuse to get to work until a stamped form of contract has been signed by the person by whom they are summoned to attend; but in view of the liability of the owner being so carefully defined by the Act, this practice seems open to question.

Charges by Volunteer Brigades.

Whereas a contracting brigade is entitled to charge for its services, a volunteer is not, and this difference does not lie, as might be supposed, in the title of the brigade, but in the right, under common law, to enter into a contract to charge for use of engine and services. This right is obtained by publishing a scale of charges, the general method adopted being to affix such scale to the door of the engine-house, or in some conspicuous place in the district. The persons employing a brigade whose scale is so published are liable for payment of such charges. Some brigades insist upon a written request to attend a fire, but it has been generally held that to summon a brigade constitutes an implied contract. On this point, however, County Court judges have at various times differed in opinion.

Water Supply for Fire Service Purposes.

Considerable care has been taken by the Legislature in granting powers to water companies that every facility shall be afforded for obtaining a proper supply of water in case of fire. Thus, in the Towns Improvement Clauses Act, 1847, Section 124, incorporated in the Public Health Act, 1875:—

The Commissioners shall cause fire-plugs and all necessary works, machinery, and assistance for securing an efficient supply of water in cases of fire to be provided and maintained, and for this purpose they may enter into any agreement with any water company or other party, and they shall paint or mark on the buildings and walls within the streets words or marks near to such fire-plugs to denote the situation thereof, and do such other things for the purposes aforesaid as they may from time to time deem expedient.

Scale of "Reasonable" Fire-Brigade Charges when Attending Fires Outside the District.

According to Mr. Orton Smith the following scale of charges is a reasonable one from the insurance point of view:—

For use of steam fire engine	£5 5s.
For use of manual fire engine	£2 2s.
(Cleaning should be included in above charges.)	
Pumpers and other helpers, average charge 6d. per hour.	
Services of chief officer .. .	£1 1s. to £2 2s.
(According to length of service.)	
Services of firemen (all officers other than chief officers ranking as firemen)	2s. first hour, 1s. per hr. after.
Horse hire, per horse	£1 1s.
Watching, per man, say	6d. per hour.
Refreshments, circumstances can be the only guide as to the necessary expenditure.	
Call or first notice of fire..	Nil.
Turncock not legally entitled to charge.	
Home watch	Nil.
Calling firemen	2s. 6d.
icen	5s.

Maximum Scale of Charges.

According to the National Fire Brigades Union, the following is the maximum scale of charges as recommended for such services:—

For each officer, 5s. for first hour and 2s. 6d. each succeeding hour or part of an hour.

For each fireman, 3s. for the first hour and 1s. 6d. each succeeding hour or part of an hour.

For each pumper, 1s. for first hour and 6d. each succeeding hour or part of an hour.

For horse hire, cleaning, refreshments, and other out-of-pocket expenses, the amount paid.

For serious damage to apparatus, the actual cost.

For the use of engines and their appurtenances, such sum as the local authority may require. The Council consider five guineas for a steamer and three guineas for a manual a fair charge.

Fire Service Intelligence Work.

For a municipal fire service it is essential to be thoroughly up-to-date, and this is only possible by being associated with the organised societies.

The borough engineer or chief officer of the fire brigade in charge of the fire service should, *ipso facto*, be a member of the British Fire Prevention Committee, the entrance fee to which is one guinea and the annual subscription one guinea.

The brigade should also be affiliated to the National Fire Brigades' Union, which costs one guinea per annum and gives the officers an opportunity of exchanging views with their colleagues and learning much that is useful.

It is of importance also that the municipal fire service should be in touch with the international aspect of fire-service matters, and public authorities do well to grant their officers permission to attend international conferences and the like.

Insurance and Benevolent Fund.

Members of the fire brigade should be well insured against accidents in some recognised insurance company, and this insurance should cover accidents of all kinds, as well as illness, whether contracted at actual fires or not. Further, it is well for the public authorities, either directly or through their chief officer, to subscribe or contribute to the National Fire Brigades' Union Benevolent Fund (hon. secretary, Mr. Bedford).

THE BUILDING ACTS AMENDMENTS OF 1905 AND THEIR ENFORCEMENT.

In matters relating to the administration of the London Building Act we have called attention to the extraordinary manner in which the County Council is dealing with the amendments of 1905. It would almost seem as if the Council wished that these amendments should be a dead letter, for they appear to act in opposition to the regulations which were obtained with a view of protecting life and property in the Metropolis.

We do not know what powers Parliament may possess to ensure that an Act is properly enforced and applied in the spirit which was intended. For instance, it has come to our notice that district surveyors, although statutory officers, have received a forcible hint that activity on their part in obtaining the Building Act Amendment Act of 1905 to be enforced is not regarded with a friendly eye, and we believe that efforts on their part to obtain its prompt enforcement may even have a distinct detrimental effect to their prospects in certain directions.

This is, of course, an extraordinary state of affairs, and is perhaps to be attributed to the change in the constitution of the London County Council and its Building Act Committee, the present "Moderate" party in power being, perhaps, desirous of allowing its middle-class voters a greater freedom from the restric-

tions of the Act than would have been the case had the "Progressives" been in office. It is certainly most regrettable however, that political influences should seem to have become a feature in the administration of such technical regulations as those of a Building Act, even if the general view of the case is not as appearances would seem to indicate.

If the party now in power really does not approve of the current Act, it would be easy enough for them to bring in amendments before the House of Commons to moderate it, but, having the Act as it stands, they should accord the greatest possible attention to its quick and effective administration, and not, as obviously seems to be the case at present, give the Amendment Act of 1905 the cold shoulder.

It is a particularly serious matter, as the amendments affect the safety of life to a more marked degree than any question of the safety of property, and this, too, should be remembered by those in power, as life is a serious thing to play with.

A NEW BAR FOR REINFORCED CONCRETE.

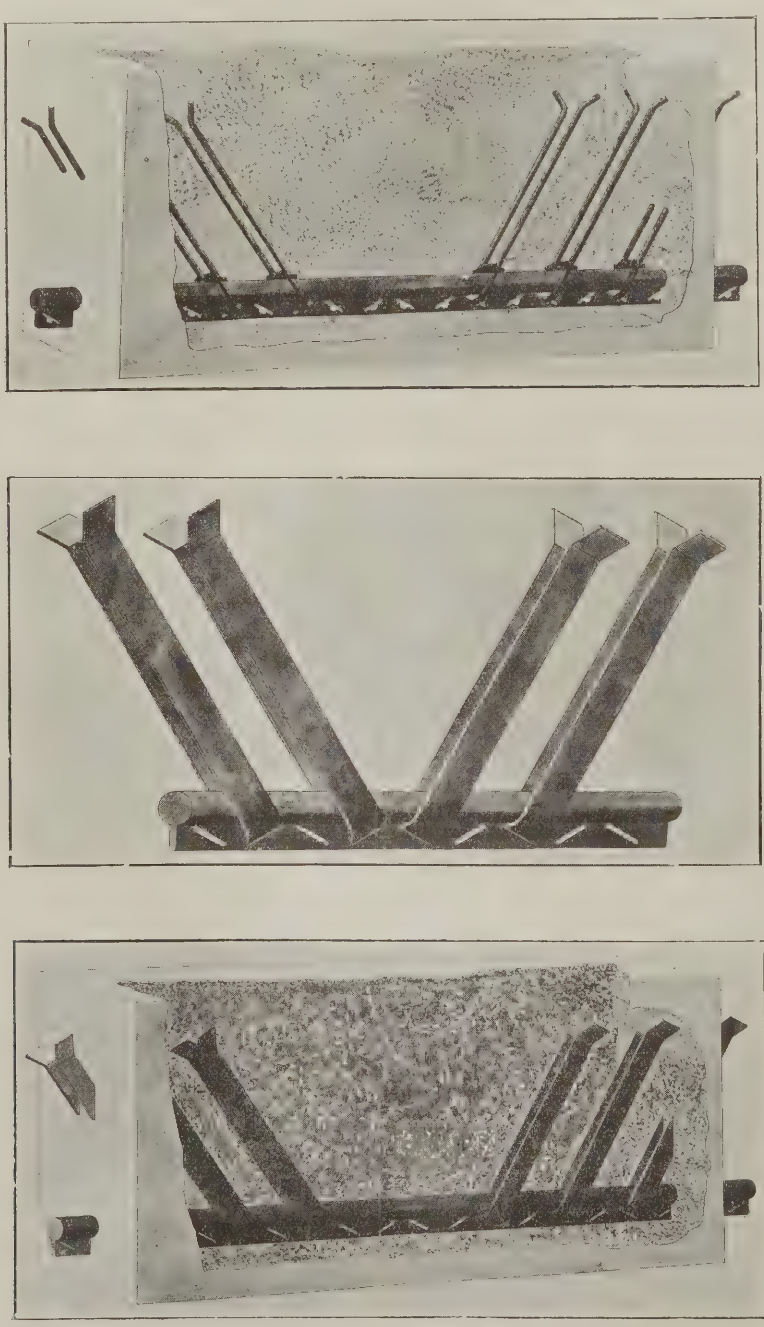
In the "Concrete and Steel Section" in our issue for February, we referred to a new steel bar for reinforced concrete construction which is being placed on the market by Mr. W. H. Brown, M.S.A., of York, and Mr. Percy Tomey, C.E., of Queen Anne's Chambers, Westminster. The bar has been called the "Perfector Bar." The accompanying illustrations show its form and use in beam construction.

The section of the bar consists, as is shown, of a round rod with a flat flange attached thereto. The flange, which is thin in proportion to the diameter to the round rod, is slotted or holed at intervals of a few inches for the insertion of stirrups or shear members. The slots are arranged either horizontally or at an angle of 45 degrees, and when the stirrups are inserted they become firmly fixed, either vertically or at an angle of 45 degrees.

It will be seen that in this form of bar the stirrups or shear members are rigidly attached; their length and spacing are in no way limited; they do not project unduly, and cannot be displaced by tamping the concrete; while the bar gives a mechanical bond throughout its length.

The bar permits of plenty of latitude in arranging details, and it affords adequate anchorage and surety against weakening by careless and ignorant workmanship in applying concrete. The steel can therefore be estimated to its definite value, and factors of safety become a reality and not a cover for negligence, bad workmanship, and uncertainty in theory. The bar can be used with equal advantage in the reinforcement of beams, columns, piles, chimneys, walls, pipes etc., and its application constitutes a distinct system of construction. Moreover, it possesses the great merit that it can be manufactured at a very low cost.

Further particulars can be obtained from Mr. Percy Tomey.



THE "PERFECTOR" BAR FOR REINFORCED CONCRETE.

FIRES FROM CINEMATOGRAPH APPARATUS.

Architects frequently have to arrange for cinematograph entertainments, either in a professional or voluntary capacity where they are acting for a public hall or similar place of amusement. It is thus well that they should have available the latest regulations of the London County Council, which cannot exactly be termed official ones, but rather serve as a set of model regulations until legislation makes them compulsory.

The regulations in question were drafted by the Theatres' Committee in consultation with the Chief Officer of the London Fire Brigade, and the Superintending Architect of the Council.*

1. No cinematograph or other similar apparatus involving the use of a lengthy combustible film shall be exhibited on premises licensed by the Council until the Council has been satisfied that all reasonable precautions have been taken against accident and danger to the public.

2. Notice of any intended exhibition shall be given to the Clerk of the Council by the licensee of the premises in which such exhibition is to be given, and the licensee shall be held entirely responsible for the proper and safe use of the apparatus. Such notice shall be given at least six days before the first day of exhibition. Opportunity shall also be afforded to the Council's inspector of inspecting the apparatus before the public exhibition takes place in order to allow time for any necessary alterations to be carried out and approved by the Council. No gangway or exit must be in any way affected.

3. The cinematograph shall stand in a suitable fire-proof room or closed sheet-iron box, of sufficient dimensions to allow the operators to work freely, and fitting closely to the floor, which shall be covered with fire-resisting material within such room or box. The door or doors shall open outwards, and be self-closing, and of the three windows which are necessary in the front face of the enclosure, the centre one shall not exceed 8 in. square, and the windows on each side shall not exceed 6 in. square; a flap screen to cover all these three holes shall be fitted and actuated both from the inside and from the outside of the enclosure; the space separating the audience and seats from the iron enclosure shall not be less than 2 ft. in width at the sides and in the front of the enclosure, and the space at the back in which the door is situated shall not be less than 6 ft. from the enclosure. The audience shall be completely excluded from the above space round the enclosure by a suitable barrier. No unnecessary combustible material shall be within the enclosure, and, as far as possible, all necessary combustible material shall be rendered fire-proof, or shall be enclosed in fire-proof receptacles. The part of the film immediately opposite the lens shall be provided with an apparatus which prevents the film, if kindled, from burning towards either of the spools.

4. The body of the lantern shall be constructed of wood or other non-conducting material, and shall be coated inside with asbestos; it shall also have an inner lining of sheet iron, and an air space shall be left between the iron and asbestos lining. In the bottom of the lantern shall stand an iron tray, which shall be surrounded by a vertical edge at least one inch in depth. The lantern shall be provided with a metal shutter, which shall fall freely between the source of light and the condenser. This shutter shall be immediately

dropped in the event of any accident to the apparatus or stoppage of the film, and shall only be raised when the film is in motion for the purpose of projection. One of the firemen of the establishment shall be in attendance near the apparatus with a wet blanket and two buckets of water.

5. Where possible the electric arc light shall be adopted as an illuminant, the usual rules for securing safety in an electric installation being observed. Ether and other inflammable liquids shall not be employed under any circumstances for producing light. If limelight be used in the lantern the general regulations for its safety, which are issued by the Council, shall be complied with, and any additional precautions which the Council may deem necessary for securing safety shall also be adopted. The use of acetylene gas other than "dissolved acetylene," will not be permitted. When "dissolved acetylene" is used the conditions set out in Order No. 6 of the Secretary of State, made under the Explosives Acts 1875, must be complied with and the gas must not be allowed to come into contact with copper or copper alloys

6. The space in which the cinematograph stands shall, where possible, be illuminated by electric glow lamps; but a miner's safety lamp may be substituted if necessary. No naked gas or oil flames, or matches, shall be allowed in the space. The lighting of the hydrogen flame in the lantern shall be accomplished by means of an electric lighter.

7. The films, when not actually passing through the lantern, shall be kept enclosed in metal cases. The film which is passing through the lantern shall be rewound, either automatically or by hand, upon another bobbin as fast as it emerges from the lantern front.

8. Not less than two, nor more than three, operators shall be engaged within the lantern enclosure during the exhibition. The whole duty of one of the operators shall consist in taking charge of the film after it has passed through the lantern.

9. The licensee shall be held responsible for the employment of competent, experienced and trustworthy operators, and shall be prepared at any time to supply to the Council satisfactory credentials in this respect.

10. Smoking within the lantern space shall be absolutely forbidden at all times.

11. The Council reserves to itself the right of modifying any of the above regulations, and of requiring the adoption of any further precautions, in addition to those specified above, as circumstances may require.

Since the issue of the above regulations, arrangements have been made by which it is probable that some legislation will shortly be on the statute book, giving local authorities throughout the country power to deal with shows of this kind, no matter where held.

New London Buildings.

The following applications came before the London County Council at their meeting yesterday, the Committee's recommendations being stated in italics:—

Erection of three iron and glass shelters at the Shepherd's Bush Empire, Shepherd's Bush Green, Hammersmith, on the application of F. Matcham and Co., on behalf of Moss Empires, Ltd. (*consent*)

Erection of a steel building at the Providence Iron Works, West Ferry Road, Millwall, on the application of S. Cutler and Sons (*consent*).

Erection of buildings upon the site of Nos. 15 and 16, Cottage Lane, City Road, Finsbury, on the application of R. Peters, on behalf of the trustees of the late C. Hall (*refusal*).

Erection of a block of flats with projecting one-storey shops in front, between Nos. 57 and 65, Shepherd's Bush Green, Hammersmith, on the application of Palgrave and Co., on behalf of H. Diprose (*refusal*).

Erection of projecting balconies on the Kingsway and Portugal Street frontages of the London Joint Stock Bank (Kingsway Branch), on the application of R. Creese Harrison and Son, on behalf of the directors of the London Joint Stock Bank (*consent*).

Erection of projecting one-storey porches to seven houses on the north-eastern side of Herne Hill Road, Norwood, on the application of H. and F. Gardner (*consent*).

Erection of projecting one-storey shops in front of Nos. 224 to 236 (even numbers only) inclusive, High Street, Lewisham, on the application of H. Dartnell and F. Adams Smith (*consent*).

Erection of projecting one-storey porches to eighteen houses on the north-western side of Finsen Road, Norwood, on the application of E. B. Ellis, on behalf of Sergeant (*consent*).

Erection of an iron and glass covered way in front of No. 25, Upper Phillimore Gardens, Kensington, on the application of W. Nash, on behalf of E. H. Tootal (*consent*).

Erection of a two-storey projection, porch, balcony and bay windows in front of Nos. 7, 7a Maida Hill West, Paddington, on the application of Boehmer and Gibbs, on behalf of W. Stubbs (*consent*).

Erection of a building upon the site of No. 5, Shepherd's Bush Green, Hammersmith, on the further application of T. B. Whinney, on behalf of the London, City and Midland Bank (*consent*).

Tenders.

Addressed postcards, on which lists of tenders may be stated, will be sent free on application to the Manager, BUILDERS' JOURNAL, *Caxton House, Westminster.*

Information from accredited sources should be sent to "The Editor," at latest by noon on Monday if intended for publication in the following Wednesday's issue. Results of Tenders cannot be accepted unless they contain the name of the Architect or Surveyor for the work.

Axminster.—For the erection of two villas for the Axminster Development Syndicate, Ltd. Messrs. Symes and Madge, architects and surveyors, Somerset House, Chard. Quantities by architects:—

Draper and Son, Crewkerne	£1,350	0	0
Perkins, Beer, Devon	1,100	0	0
Spiller and Son, Taunton	1,099	0	0
Bishop and Son, Chard	1,087	4	11
Bazley and Smith, Axminster	1,080	0	0
Rider and Co., London	1,066	0	0
Cloud and Clarke, Axminster	1,050	0	0
Munford and Son, Crewkerne	1,028	0	0
Relleen and Griffiths, Ilminster	1,025	0	0
Newbery and Son, Axminster	1,010	0	0
*Parsons Bros. and Dunster, Perry Street, Chard	956	0	0

*Accepted. Architects' estimate, £1,030.

Barnard Castle.—For the erection of bridge over Thorsgill Beck, for the Startforth Rural District Council:—E. Newbolt, mason, Bowes, Barnard Castle. Quantities for successful contractor taken off by Mr. T. Farrow, architect, Barnard Castle.

Fishguard (Pembroke).—For erection of new Council school buildings at Fishguard, for the Pembrokeshire Education Authority. Mr. D. Edward-Thomas, 17, Victoria Place, Haverfordwest, architect:—

Rowlands and Davies, Newport, Mon.	£6,798	0	0
G. Mercer, Llanelly	6,200	0	0
Davies and Morgan, Pembroke	5,725	0	0
Davies and Francis, Hengoed	5,690	0	0
A. Heatherley and Co., Pembroke	5,650	0	0
R. Phillips, Pembroke	5,499	0	0
W. Thomas and Co., Cardiff	5,471	0	0
R. Davies, Carmarthen	5,438	0	0
Davies and Griffiths, Tenby	5,422	17	0
Davies and Sons, Cardiff	5,390	0	0
Cole and Sons, Milford Haven	5,158	0	0
*John and Griffiths, Fishguard	4,869	0	0

*Accepted.

Harrow.—For additions to "Frosbury," Northwick Park. Mr. E. A. Crooke, A.R.I.B.A., architech, Lowlands Road, Harrow:—

C. Perren, Wealdstone	£237	5	0
J. Simmonds, Harrow	217	3	0
J. Batchelor, Harrow	214	0	0
A. E. House, Harrow	200	0	0
*C. D. Norton, Harrow	140	0	0

*Accepted.

Larne (Ireland).—For the construction of works for improving the water supply, for the Larne Urban District Council. Messrs. Swiney and Croasdaile, MM.I.C.E., Avenue Chambers, Belfast, engineers:—

R. C. Brebner and Co., Edinburgh	£8,256	0	0
J. Galloway and Sons, Sligo	7,326	5	6
J. Graham, Dromore	6,642	18	7
Fleming Bros., Portrush	6,091	2	1
C. H. Wallace, Dublin	6,007	0	0
Thornbury Bros., Belfast	5,922	7	10
Grainger Bros., Holywood	5,394	17	2
R. D. Pollock, Bangor	5,096	10	4
*Hoggarty and Gault, Ballymena	4,935	6	5

*Accepted.

London, N.E.—For the kerbing, channelling, paving, making-up, etc., of Holmleigh Road, Stamford Hill, for the Hackney Borough Council. Mr. Norman Scorgie, M.I.C.E., borough engineer and surveyor:—

E. T. Bloomfield, South Tottenham, N.	£1,617	8	5
W. Griffiths and Co., London, E.C.	1,5[illegible]5	3	9
Grounds and Newton, South Tottenham, N.	1,545	16	6
T. Adams, Wood Green, N.	1,458	8	2
A. T. Catley, London, W.C.	1,440	15	11
G. Porter, Hackney, N.E.	1,425	8	6
*R. Dykes, Chiswick	1,424	8	3
E. F. Knifton, Upper Edmonton, N. (withdrawn)	1,219	15	10

*Accepted.

London.—For the supply and delivery of about 525 tons of track rails and fastenings required for the reconstruction of the tramways from Brixton Road to near Camberwell Green, for the London County Council:—

Barrow Hæmatite Steel Co., Ltd., London, E.C.	£5,062	1	3
Bolckow, Vaughan and Co., Ltd., London, E.C.	4,053	11	3
Walter Scott, Ltd.,* Leeds	3,978	2	6

Chief engineer's estimate, £3,876 2s. 6d.

*Recommended for acceptance.

London, N.—For rebuilding the two bridges carrying Caledonian Road, over the Great Northern Railway and the Regent's Canal, in connection with the electrification of the tramways in that thoroughfare, for the London County Council:—

Thos. W. Pedrette, London	£10,601	3	6
Pedrette and Co., London, N	10,348	1	8
The Motherwell Bridge Co., N.B.	10,035	7	0
Alfred Thorne and Sons, Westminster	9,562	7	6
Anthony Fasey and Son, Leytonstone	8,902	10	10½
Heenan and Froude, Ltd., Manchester	8,896	12	7
A. Jackaman and Son, Slough	8,349	0	0
W. Pattinson and Sons, Ltd., Westminster	8,231	[illegible]	[illegible]
D. G. Somerville and Co., London, E.C.	8,11[illegible]	[illegible]	[illegible]
Greig and Matthews, London, E.C.	7,868	17	4
D. R. Paterson, Ltd., Camden Town, N.W.	7,679	7	6
W. Manders, Leyton	7,615	7	1
Orr, Watt and Co., Ltd., Motherwell, N.B.	7,584	14	0
P. Wilson and Co., London, E.C.	7,497	5	5
Rawkins and Jackson, London, E.C.	7,497	0	0
Rawlingsons and Co., London, E.C.	7,355	8	[illegible]
Joseph Westwood and Co., Ltd., Millwall, E.	7,152	14	3
W. Muirhead and Co., Ltd., London, E.C.	7,030	10	5
Dick, Kerr and Co., Ltd.,* London, E.C.	6,895	11	2

Chief engineer's estimate, £7,842.

*Recommended for acceptance.

Newport, Mon.—For alterations and additions to Summerhill Baptist Chapel, and the erection of a new lecture hall adjoining. Mr. Arthur E. Sheppard, architect, 39, High Street, Newport:—

H. J. Herbert	£2,890	0	0
F. C. Parfitt	2,875	0	0
J. Charles	2,874	0	0
R. Moon	2,850	0	0
C. H. Reed	2,840	8	0
G. F. Leadbeter	2,803	0	0
Phillips, Clarke and Co.	2,780	0	0
J. H. Williams	2,749	0	0
Jewell and Son	2,733	0	0
F. W. Powles	2,730	0	0
A. S. Morgan	2,700	0	0
J. H. Leadbeter	2,[illegible]07	0	0
Poulton and Whiting, Pontnewydd	2,669	7	0
C. Shopland	2,628	0	0
T. Hill	2,600	0	0
*E. F. King and Co.	2,488	0	0
Dowden and Co.	2,472	9	9
J. Williams and Son	2,350	0	0

Rest of Newport.

*Accepted.

Sandiacre (Notts).—For erection of four pairs of villas, King Edward Street, Sandiacre, for the Stapleford and Sandiacre Co-operative Society. Mr. Walter H. Woods, M.R.S.I., Long Eaton, architect:—

General work.

Musson, Carrington, Notts	£2,390	0	0
Shelton, New Sawley, near Derby	2,346	0	[illegible]
Brennan and Loftus, Ockbrook	2,289	1	[illegible]
J. and J. Warner, Mickleover, near Derby	2,2[illegible]8	[illegible]	[illegible]
F. M. Thompson and Son, Nottingham	2,[illegible]59	[illegible]	[illegible]
Brown and Son, Long Eaton	2,060	0	0
F. Perks and Son, Long Eaton	2,034	0	0
Gilbert and Hall, Nottingham	2,018	0	0
Birkin and Rowland, Kimberley, Notts	2,000	0	0
F. Martin, Stapleford, Notts	1,997	18	9
*Stevens, Long Eaton	1,874	7	0

*Accepted.

St. Asaph (Wales).—For the construction of (a) concrete service reservoir, filters, providing and laying about 3,500 lineal yards of cast-iron 4in. and 3in. spigot and faucet water-pipes, and other works connected therewith, at Llanfairtalhaiarn, near Abergele; (b) sewerage and sewage-disposal works also at Llanfairtalhaiarn—the works include the providing and laying of about 1,000 yards of 6in. stoneware pipe sewers, manholes, lampholes, ventilators, etc., together with septic tank and irrigation works at outfall—for the St. Asaph (Denbigh) Rural District Council. Messrs. T. B. Farrington and Son, Llandudno, engineers:—

E. R. Lester, Plymouth	£4,846	0	0
O. Williams and Co., Llysfaen	3,600	0	0
Johnson Bros., Hereford	2,817	7	11
P. Edwards, Dodleston, Chester	2,793	[illegible]	[illegible]
Castle and Co., Llandrindod Wells	2,732	10	2
Hughes and Williams, Prestatyn	2,712	16	4
Collingwood and Co., Claygate, Surrey	2,581	7	0
R. L. Roberts, Llandudno	2,526	18	2
Davies and Jones, Colwyn Bay	2,450	0	0
I. Dean and Co., Manchester	2,405	3	6
Hughes and Rowlands, Colwyn Bay	2,351	10	0
W. Underwood and Bro., Dukinfield	2,204	1	9
R. E. Williams, Colwyn Bay	2,161	2	5
W. P. Meikle, Liverpool	2,069	9	5
H. E. Buckley, Bradford	2,554	10	6
J. T. Jones, Cefn, Ruabon	1,962	10	8
J. W. Harris, Shrewsbury	1,949	19	3
R. C. Crawford, Uddingston	1,857	3	10
F. Mitchell and Son, Manchester	1,800	0	0
*R. Allen, Halton View, Widnes	1,754	11	1

*Accepted.

Walton.—For the erection of engine and boiler houses, etc., at Walton, for the Metropolitan Water Board:—

Portland Stone.

T. W. Pedrette	£120,162	0	0
Hughes and Stirling	117,300	0	0
C. Wall, Limited	105,072	0	0
F. and H. F. Higgs	104,692	0	0
Perry and Co.	99,822	0	0
Muirhead and Co.	99,403	0	0
Foster and Dicksee	99,324	0	0
T. J. Hawkins and Co.	94,863	0	0
F. Miskin, Limited	92,865	0	0
A. E. Nunn	92,739	0	0
A. Leather	91,594	0	0
McCormick and Sons	91,440	0	0
A. N. Coles, Plymouth	89,566	0	0
G. E. Wallis and Sons	87,289	0	0
R. McAlpine and Sons	87,214	0	0
G. Munday and Sons	87,160	0	0
W. Lawrence and Son	87,000	0	0
J. Moran and Son	86,179	0	0
J. Mowlem and Co.	85,000	0	0
Whitehead and Co.	84,100	0	0
W. Pattinson and Sons	84,085	0	0
A. Jackaman and Son	83,000	0	0
Holloway Bros.	82,465	0	0
Holliday and Greenwood	82,378	0	0
J. Aird and Sons	81,558	0	0
W. Shurmur and Sons	81,387	0	0
W. Moss and Sons	80,894	0	0
Kirk and Randall	79,893	0	0
G. Hay and Co.	79,529	0	0
McC. R. Fitt	78,494	0	0
Waring and White (1906)	72,431	0	0
Dick, Kerr, and Co.	68,472	0	0

Engineer's estimate, £90,875.

Forest of Dean stone in lieu of Portland.

T. W. Pedrette	£120,162	0	0
Hughes and Stirling	115,618	0	0
C. Wall, Limited	104,820	0	0
F. and H. F. Higgs	101,750	0	0
Perry and Co.	99,288	0	0
Muirhead and Co.	99,133	0	0
Foster and Dicksee	98,909	0	0
T. J. Hawkins and Co.	93,426	0	0
F. Miskin, Limited	92,535	0	0
A. E. Nunn	92,017	0	0
A. Leather	90,311	0	0
McCormick and Sons	90,902	0	0
A. N. Coles	88,753	0	0
G. E. Wallis and Sons	86,479	0	0
R. McAlpine and Sons	86,285	0	0
G. Munday and Sons	86,832	0	0
W. Lawrence and Son	87,000	0	0
J. Moran and Son	85,754	0	0
J. Mowlem and Co.	84,600	0	0
Holliday and Greenwood	84,001	0	0
Whitehead and Co.	82,144	0	0
W. Pattinson and Sons	83,499	0	0
A Jackaman and Son	82,720	0	0
Holloway Bros.	82,765	0	0
J. Aird and Sons	80,501	0	0
W. Shurmur and Sons	80,460	0	0
W. Moss and Sons	80,554	0	0
Kirk and Randall	79,418	0	0
G. Hay and Co.	79,616	0	0
McC. R. Fitt	80,536	0	0
Waring and White (1906)	74,385	0	0
Dick, Kerr, and Co.	67,777	0	0

Engineer's estimate, £90,474.

White glazed facings and Portland.

T. W. Pedrette	£121,530	0	0
Hughes and Stirling	118,377	0	0
C. Wall, Limited	106,236	0	0
F. and H. F. Higgs	106,103	0	0
Perry and Co.	100,859	0	0
Foster and Dicksee	100,396	0	0
T. J. Hawkins and Co.	96,035	0	0
F. Miskin, Limited	94,112	0	0
A. E. Nunn	93,729	0	0
A. Leather	92,422	0	0
McCormick and Sons	92,484	0	0
A. N. Coles	90,579	0	0
G. E. Wallis and Sons	88,372	0	0
R. McAlpine and Sons	88,491	0	0
G. Munday and Sons	88,212	0	0
W. Lawrence and Son	88,362	0	0
J. Moran and Son	87,558	0	0
J. Mowlem and Co.	86,135	0	0
Whitehead and Co.	£85,126	0	0
W. Pattinson and Sons	85,162	0	0
A. Jackaman and Son	83,878	0	0
Holloway Bros.	83,592	0	c
Holliday and Greenwood	83,365	0	0
J. Aird and Sons	82,886	0	0
W. Shurmur and Sons	82,611	0	0
W. Moss and Sons	81,966	0	0
Kirk and Randall	81,130	0	0
G. Hay and Co.	80,761	0	0
McC. R. Fitt	79,705	0	0
Waring and White (1906)	73,316	0	0
*Dick, Kerr, and Co.	69,542	0	0

Engineer's estimate, £91,667.

White glazed facings and Forest of Dean.

T. W. Pedrette	£121,530	0	0
Hughes and Stirling	116,695	0	0
C. Wall, Limited	105,984	0	0
F. and H. F. Higgs	103,161	0	0
Perry and Co.	100,325	0	0
Foster and Dicksee	99,981	0	0
T. J. Hawkins and Co.	94,598	0	0
F. Miskin, Limited	93,782	0	0
A. E. Nunn	93,006	0	0
A. Leather	91,139	0	0
McCormick and Sons	91,946	0	0
A. N. Coles	89,766	0	0
G. E. Wallis and Sons	87,562	0	0
R. McAlpine and Sons	87,562	0	0
G. Munday and Sons	87,884	0	0
W. Lawrence and Son	88,362	0	0
J. Moran and Son	87,133	0	0
J. Mowlem and Co.	85,735	0	0
Whitehead and Co.	83,170	0	0
W. Pattison and Sons	84,576	0	0
A. Jackaman and Son	83,598	0	0
Holloway Bros.	83,892	0	0
Holliday and Greenwood	84,988	0	0
J. Aird and Sons	81,830	0	0
W. Shurmur and Sons	81,684	0	0
W. Moss and Sons	81,626	0	0
Kirk and Randall	80,661	0	0
G. Hay and Co.	80,848	0	0
McC. R. Fitt	81,747	0	0
Waring and White (1906)	75,270	0	0
Dick, Kerr, and Co.	68,847	0	0

Engineer's estimate, £91,267. *Recommended for acceptance, with an addition of £115 for Ibstock bricks.

Coming Events.

Wednesday, March 11.

Architectural Association (Discussion Section).—Mr. Frederick Hiorns, A.R.I.B.A., on "Roofs, Dormers, and Chimney Stacks," at 7.30 p.m.

Edinburgh Architectural Association (Associates' Meeting). — Mr. Ramsay Traquair, A.R.I.B.A., on "Architectural Heraldy," at 8 p.m.

Northern Architectural Association.—Opening of exhibition of R.I.B.A. and N.A.A. prize drawings, at 7.30 p.m.

Glasgow Institute of Architects.—Mr. James Salmon, F.R.I.B.A., on "The Decoration of Steel and Ferro-Concrete Structures."

Society of Arts.—Mr. Ernest R. Matthews, on "The Use of Reinforced Concrete in Engineering and Architectural Construction in America," at 8 p.m.

Auctioneers' Institute of the United Kingdom.—Mr. Ernest Runtz, on "Hostelries, Ancient and Modern," at 7.45 p.m.

Institution of Civil Engineers.—Students' visit to the Enfield-Stevenage Loop Line, under construction, of the Great Northern Railway.

Thursday, March 12.

Manchester Society of Architects.—Discussion on students' drawings, at 6.30 p.m.

Sheffield Society of Architects and Surveyors.—Mr. T. Winder, A.M.Inst.C.E., on "Feudal Tenures."

Leeds and Yorkshire Architectural Society.—Mr. Paul Waterhouse, M.A., F.R.I.B.A., on "Some Modern Conditions of our Art," at 6.30 p.m.

Carpenters' Company.—Mr. James Powell on "The History of Painted Glass and its Process," at 8 p.m.

Friday, March 13.

Birmingham Architectural Association.—Mr. G. R. Jones on "Old Cottages and Manor Houses."

Glasgow Technical College Architectural Craftsmen's Society.—Mr. Thomas Frazer on "Domestic Hot-Water Supply."

Saturday, March 14.

Architectural Association.—Fifth Spring visit to London, Edinburgh, and Glasgow Assurance Building, Euston Square (Professor Beresford Pite, F.R.I.B.A., architect).

Monday, March 16.

Royal Institute of British Architects.—Mr. Hippolyte J. Blanc, R.S.A., F.R.I.B.A., on "A Modern Asylum: Bangour Village, near Edinburgh," at 8 p.m.

Institute of Sanitary Engineers.—Mr. J. Freebairn Stow on "A Description of the several Sewage Disposal Works in the Uxbridge District," at 8 p.m.

Wednesday, March 18.

Manchester Society of Architects (Club Night).—Paper by Mr. Phil. Barker, at 6.30 p.m.

Thursday, March 19.

Architectural Association (Camera and Cycling Club).—Mr. Edwin Gunn, A.R.I.B.A., on "Timber, Brick and Plaster in the Eastern Counties," at 7.30 p.m.

Friday, March 20.

Architectural Association.—Mr. Henry Tanner, junr., F.R.I.B.A., on "Some Notes on Domestic Work of the Renaissance in England," at 7.30 p.m.

Saturday, March 21.

Institute of Sanitary Engineers. — Visit to Sewage Disposal Works of the Joint Drainage Scheme, Cowley, Middlesex.

Edinburgh Architectural Association.—Visits to St. Peter's Church, Falcon Avenue; and to the private Oratory of the Archbishop, Greenhill Gardens.

Architectural Association.—Sixth spring visit, to the works of the Associated Portland Cement Manufacturers, Ltd., at Swanscombe.

Wednesday, March 25.

Architectural Association (Discussion Section).—Mr. Arch. J. Nicholson, on "Stained Glass," at 7.30 p.m.

Edinburgh Architectural Association.—Mr. F. Gordon Brown on "Dalmatia," at 8 p.m.

Northern Architectural Association.—Annual General Meeting, at 7.30 p.m.

Thursday, March 26.

Leeds and Yorkshire Architectural Society.—Mr. Percy S. Worthington, M.A., F.R.I.B.A., on "Phillipo Brunelleschi and his Work in Florence," at 6.30 p.m.

Friday, March 27.

Birmingham Architectural Association.—Mr. G. Salway Nicol, A.R.I.B.A., on "The B.A.A. Excursion to Picardy.'

Glasgow Technical College Architectural Craftsmen's Society.—Mr. Alex. W. R. Bell on "Good and Bad Practice in Buildings."

Monday, March 30.

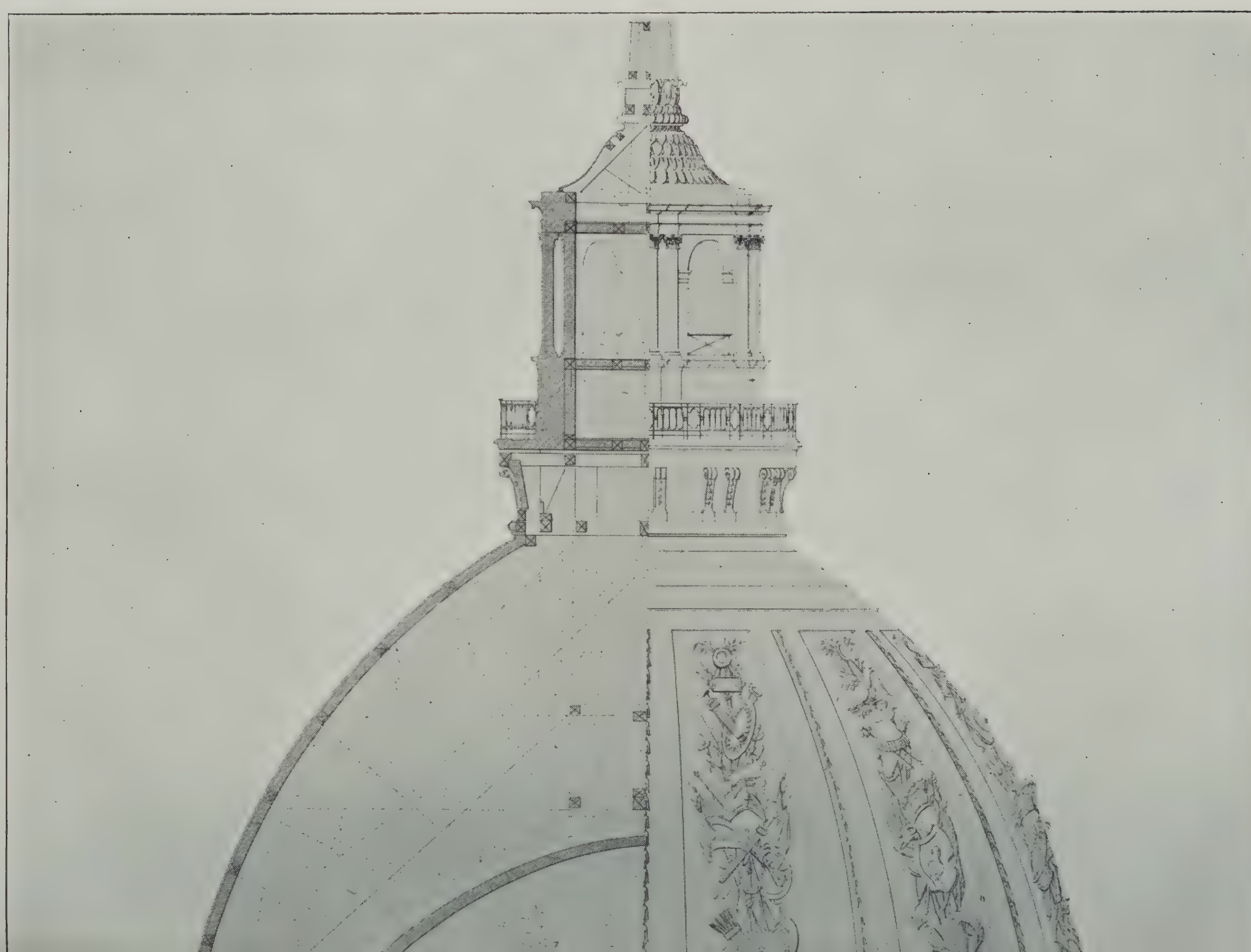
Royal Institute of British Architects.—Paper on "Theatre Planning," at 8 p.m.

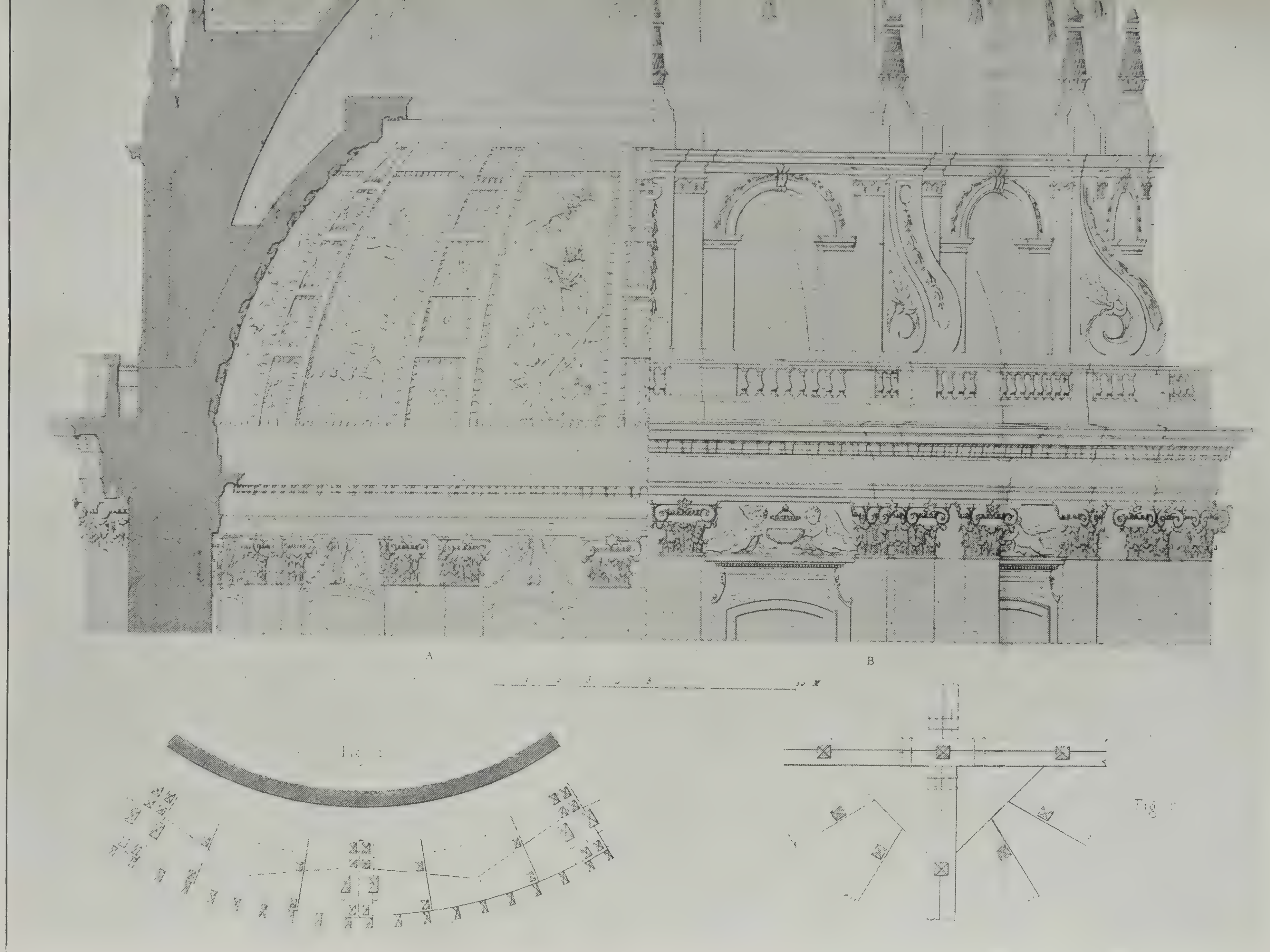
Surveyors' Institution.—Ordinary General Meeting, at 8 p.m.

New Companies.

Building, Finance and Contract Corporation, Ltd., London. Capital: £5,000.

Considere Construction Co., Ltd., to acquire and turn to account any patents, licences, concessions and the like relating to any invention for improvements in the construction of buildings, bridges, arches and other works in reinforced concrete or other material, and to adopt an agreement with W. R. Fasey. The first directors are: W. R. Fasey, G. E. Gray, A. C. Adams, A. L. Hickman and T. B. Shore. Registered Office: 5, Victoria Street, Westminster. Capital: £12,500, in £1 shares.





THE DOME OF THE HÔTEL DES INVALIDES, PARIS. MANSART, ARCHITECT.

March 18, 1908. Volume 27, No. 684.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 364, Westminster.

Date of Publication: The Builders' Journal and Architectural Engineer is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The Subscription Rates per annum are as follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

The Shakespeare Memorial.

Notwithstanding Ben Jonson's perfectly sincere eulogy of his friend and fellow dramatist, it is quite conceivable, as a well-known writer has pointed out, that Shakespeare's contemporaries — despite the immense popularity of some of his plays—had no adequate conception of what manner of man or majesty of mind was among them, and consequently held his works in no especial esteem. But their successors were more discriminating, and to-day, nearly three hundred years after his death, we are able to realise the undoubted fact that Shakespeare has long been enthroned, by universal consent, as the idol not only of his nation, but of the whole world. The proposal, therefore, to erect a great memorial to him in London will be received with general satisfaction. After much preliminary labour, during which various suggestions with regard to sites more or less suitable for the erection of "an architectural monument, including a statue," were discussed, and, in turn, rejected, the selection has fallen upon the semi-circular portion of the south side of the garden of Park Crescent, facing Portland Place. The choice of this site necessitates the removal of the existing statue to the Duke of Kent, but it is understood that His Majesty the King has graciously assented to its transference to another position in the immediate neighbourhood. Possibly the site that has been finally selected is the best one available, but we regret it was not found practicable to erect the monument on the south bank of the Thames, in the locality so closely associated with the poet's active life in London during his long connection with that quaint old-world structure known as the Globe Playhouse, which, with the older theatre at Blackfriars, shared the honour of producing many of Shakespeare's later and more important plays. We understand that the conditions for a competition have now been drawn up, and that it is intended to make the completion of Shakespeare's memorial the crowning event of the year 1916, the tercentenary of the poet's death. It is also confidently anticipated that the scheme will represent, financially and otherwise, a real world-tribute. The Municipality of Venice, for instance, has sent a generous message, accompanied by an equally generous donation, towards the funds of the proposed memorial. That donation accentuates our feeling of disappointment that "for practical reasons" which they are advised are "artistically imperative," the Committee have decided to restrict the competition for the design of the memorial to artists among the English-speaking peoples. Unfortunately architects and sculptors of our own country do not, as a rule, exhibit conspicuous ability in their designs for monuments to the illustrious dead, and the proposed competition for the Shakespeare Memorial is one in which the highest artistic talent available, both at home and abroad, should be freely utilised. An international competition, with an international jury of assessors, would be likely, in our opinion, to secure a better result than can reasonably be expected under the restriction proposed by the Committee. Foreign countries are to be appealed to for financial assistance on the ground that Shakespeare's genius is recognised and appreciated by the whole world; but the architects and sculptors of those countries—France especially—who are immeasurably ahead of us in knowledge (and understanding) of the true principles of their art, are not to be admitted as competitors. We trust that this condition will be removed, and we hope also that some representative American architects will be placed on the jury of assessors to assist their English brethren, whose general predilections in favour of designs of a "rococo" or *bizarre* character are rapidly becoming notorious. Surely he "who was not of an age but for all time" is worthy of a monument possessing artistic merit of a far higher order than that usually presented in the designs so often foisted upon the community by ill-trained assessors.

Mr. Bernard Shaw's Views.

Mr. Bernard Shaw, of necessity, has a share in the discussion that is going on about this Shakespeare Memorial. He says:—"If another statue of Shakespeare is wanted, it can be placed in the hall of a national theatre much more fitly than in a place which did not even form a part of Shakespeare's London. There is only one living sculptor who could, without an unbearable anticlimax, be entrusted with a monument to Shakespeare, and that is the Frenchman Rodin, a man no less great than Shakespeare himself. It is pitiful enough that Rodin stands at present commissioned, for the paltry sum of £2,000, to create a monument in London to an American painter, who certainly did good service to art as a connoisseur, but whose achievements as an artist are trivial from the standpoint of Shakespeare and Rodin. But to have the unveiling of the Whistler memorial come at the same time as the expenditure of £200,000 on a monument to Shakespeare by a sculptor of the school which has produced the Shakespeare statue in Leicester Square, and the hardly less characteristic image of the late Duke of Cambridge in Whitehall, would be out of all proportion. Yet it is quite certain that if it were proposed to offer the £200,000 to Rodin an outcry would immediately be made against

him by all the surviving representatives of the Elizabethan enthusiasts who thought Chapman much greater than Shakespeare, and who, had they been his contemporaries, would have treated him exactly as they to-day treat Wagner, Ibsen, Rodin, and all the unmistakeably great men who have made their age illustrious. These worthy people may possibly know a gentleman when they see him: they certainly do not know a genius. From all the risks of bathos, jobbery, and vulgarity that attend the monumental scheme, the national theatre scheme is free. In such a theatre the living genius of successive generations of English actors can keep the sacred fire alive. They, and not the eminent firms of monumental masons who would get the Portland Place job, are the rightful commemorators and custodians of Shakespeare's genius. . . . "

The Architects' Technical Bureau. — The proposal to establish a central Technical Bureau appears to be rapidly maturing, and we understand that more than 1,000 architects have now signified their intention of becoming subscribers. If properly organised and administered, the undertaking can scarcely fail to prove of great benefit to busy architects, many of whom have long since abandoned any attempt to classify, and file for future reference, the ever-increasing number of trade circulars, catalogues, price lists, and brochures which are showered upon them. The exact, up-to-date, and reliable information concerning any building speciality which the Bureau proposes to supply to its subscribers will therefore be much appreciated by members of the architectural profession. But in addition to collecting and classifying valuable data concerning building materials and building methods, the Bureau proposes, from time to time, to engage experts to carry out a series of tests on any new constructional speciality which may be brought under its notice. The production of these reports, which will be prepared under the immediate auspices of the Advisory Committee of architects (the constitution of which will be a guarantee of the absolutely fair and impartial manner in which the various tests have been conducted), should prove an admirable feature of the Bureau's work. The Advisory Committee for the time being consists of Messrs. George Bertram Bulmer, F.R.I.B.A. (Leeds), A. W. S. Cross, M.A., F.R.I.B.A. (London), Joseph Crouch (Birmingham), H. L. Goddard, M.A., F.R.I.B.A. (Leicester), George Hubbard, F.S.A., F.R.I.B.A. (London), Paul Ogden, F.R.I.B.A. (Manchester), William A. Pite, F.R.I.B.A. (London), H. D. Searles Wood, F.R.I.B.A. (London), Edwin Seward, F.R.I.B.A. (Cardiff), and Keith D. Young F.R.I.B.A. (London). It is proposed that the Advisory Committee shall be subject to election from time to time by the general body of subscribers. Any readers desiring further information about the Bureau should write to the secretary, Mr. F. R. Gould Wills, A.R.I.B.A., Bloomsbury Mansions, 24, Hart Street, London, W.C.

A Consulting Architect and Competition Specialist. A correspondent sends us a remarkable communication he has recently received from a member of the architectural profession, who describes himself as a "Consulting Architect and Competition Specialist." The document includes a written letter, containing the author's terms for the preparation of all necessary preliminary and completed competition drawings, and printed matter comprising (1) a list of some of the open competitions in which his designs have secured the first or second places, (2) particulars of his inventions and patents "now before the public, or the subject of further experiments," and (3) a "declaration," sworn before a Commissioner of Oaths, relative to his professional training and architectural experience. We learn from the latter statement that this architect has been engaged, during the past ten years, in rendering "special services to many well-known architects in England, Wales and Ireland, in the capacity of expert and consulting architect," and that, within that time, he has devoted much of his leisure to the preparation of designs "for almost every class of building submitted in open public competition," of which a large number have been successful. Indeed, we are specifically told, in the following paragraph of his statement, that the aggregate cost of the many buildings represented by the successful designs in question is estimated at about £962,000, and that "according to our Institute's authorised scale" the remuneration of the various architects who were so fortunate as to avail themselves of our friend's services amounted to no less a sum than £37,750. It is not necessary to give the long list of the successful competitions included in schedule (1)—which, by the way, would have been far more interesting if the *dates* of the various competitions and the *location* of the proposed buildings for which they were instituted, had been appended—so we have roughly grouped the "successes" under the following heads, namely:—Churches and chapels, £11,450; technical schools, £147,750; hospitals and infirmaries, £45,450; museums, £120,000; art galleries, £74,000; art schools, £7,200; municipal buildings, £26,300; hotels and clubs, £86,000; public halls, £23,500; corporation baths and concert rooms, £55,000; free libraries, £12,200. The designer of this goodly array of buildings modestly says he "is informed" that this degree of success "constitutes almost a record," and we have much pleasure in endorsing the opinion of his informant. Indeed, we feel that, had we been appealed to for an expression of opinion, our inherent, but absolutely irrepressible, tendency to worship at the shrine of success, would have resulted in the production of a far more glowing encomium on, what we venture to regard as, an altogether unparalleled effort of genius which displays "the imaginative faculty of the artist," to which allusion was recently made by Mr. T. G. Jackson, R.A., and his colleagues, at its very highest development. We are bound to say that the latter part of the sworn "declaration," chiefly concerned with such prosaic matters as patents for inventions or improvements in "double oscillating lever locks," tobacco pipes, regulating mineral water bottles, and "means of reflecting or diffusing daylight into the interior of buildings," is somewhat disappointing, but in this, our more chastened mood, we are, perhaps, better fitted to appreciate the awe-inspiring terms of the conclusion of the solemn "declaration" made by its author "conscientiously believing the same to be true and by virtue of the Statutory Declarations Act, 1835."

"Please Keep this Card for Reference." We have received a printed card, emanating from a certain firm of timber merchants, with the following:—"Several of our customers having at various times asked us to recommend them to a cheap but reliable architect who could prepare plans and quantities for them when they were busy, we have great pleasure in recommending Mr. ———, of London, whom we have known for some years and can strongly recommend as a conscientious and thoroughly reliable man. His charges are: Plans from £1 1s. per set. Quantities from 1 per cent. Work superintended in any part of the country. Estates laid out and developed. Land surveys, etc." No comment is needed.

Trouble in the Building Trade in Germany. Those who suffer from troubles in the building trade in this country may find some solace in the fact that much the same thing is experienced abroad. In Germany just now a very serious crisis has arisen. The associated master builders have elaborated a model tariff as to hours and wages, which was presented to the workmen's unions, by whom, however, it was rejected wholesale. Hence the present *impasse*. A last endeavour to arrive at an agreement was made by both sides on Monday at Frankfort, but at the time of going to Press we do not know the result of the proceedings; judging from reports, however, the chances of a satisfactory settlement would seem remote. In the event of no arrangement being arrived at, a general lock-out will be proclaimed by the men. What this means may be gauged from the fact that in Westphalia alone 20,000 workmen would be thrown out of employment. It is in the nature of things that strikes and lock-outs should occur, but they are always to be deplored. They cause incalculable harm to the building trade, both to masters and men, and when they are at last brought to an end they generally leave behind them a very bitter

feeling on one side or the other. We regard, therefore, with the greatest approval the establishment of Conciliation Boards by the National Federation of Building Trade Employers, and we trust that these will prove an increasing means of settling labour differences in the only way which can be regarded as really satisfactory.

ARCHITECTURAL COMPETITIONS.

By an Occasional Contributor.

The resolution in favour of the jury system of judging competitions recently brought forward at the Royal Institute of British Architects is but one symptom of the general dissatisfaction with the present conduct of competitions.

This resolution calls attention to one particular evil, but it must be remembered that this is not the only one, or even the worst evil. The system of competing is quite as bad as the system of judging, and needs as much reform.

The real trouble seems to be that competitors and assessors are not agreed amongst themselves on the rules of the game, and are therefore at cross purposes. The competitors submit drawings for a building from which the assessor is expected to select the best, but there are no generally accepted principles of design upon which the work is adjudged, and no generally accepted standard of criticism under which the assessor makes his award.

The first necessity is to lay down these principles of design, and thus create the requisite standard of merit. At present no one seems to know or care what architecture really is, and we are not agreed upon the necessary qualities incidental to the making of a fine building. The result is chaos, and until we do agree the result always will be chaos, whether we have one assessor or fifty.

Some competitors rightly regard a building as an organism fulfilling certain definite functions, an organic structure with its outward appearance exactly expressing its character and the nature of its functions, but it is well known that some architects "care for none of these things."

What is the good of sending in a scheme comprising an organic structure, which is accompanied by an elevation simply and naturally expressing that structure, if, for all one knows, the assessor (and probably half the competitors) regard a building as a kind of packing-case whose external aspect need bear no relation whatever to its internal functions?

Or again, why trouble about any general scheme of construction at all if the assessor thinks that steel construction was purposely invented to make planning easier for incompetent designers, or why attempt to satisfy the needs of modern sanitation if the assessor pins his faith on the insanitary arrangements of fifty years ago? In fact, what is the good of playing the game at all if everyone, including the umpire, has a separate set of rules of his own? And what, in such circumstances, is the advantage of *three* umpires over one?—except (were such a thing possible) to make confusion worse confounded and the fun still more fast and furious.

THE HOTEL DES INVALIDES, PARIS.

Is not all this more than a little ridiculous? When one comes to think of it, the present position of affairs is so farcical that it is difficult to realise such a state of things does actually exist outside a lunatic asylum and has been endured by an intelligent body of men for more than a quarter of a century.

There are indications, however, that we have had enough of it, that the farce is at last played out, and that a desire for unity of ideas is felt by us all. We are beginning to think that it might be as well to lay down the rules of the game before we start to play it, to evolve order out of chaos, to come to some understanding between ourselves (before we begin the preparation of our competitive drawings) as to what it is we are trying to do, what the nature of such or such a building should be, what qualities it should possess, and on what principles it should be designed. Finally, let us be careful to appoint an assessor who understands these principles and will act upon them.

This seems to be the one fundamental necessity, the reform of ideas; all else seems to be of secondary importance, a matter of policy, of detail, of practical arrangements.

But although one assessor, who knows the game and plays it fairly, is better than three who do not, yet there is no doubt that in the present circumstances the more assessors there are the better, if only to bring home to them and to us all the absurdity of the present position. For while it is possible that separate individuals, acting independently, may continue to assess for years without in the least realising that they are all giving awards on different lines, and so contradicting and stultifying one another, it is not probable that six men could often act together without appreciating their differences and endeavouring to come to some agreement as to the first principles, so evolving some system of assessing which shall do more than record their individual taste and opinions.

It is not easy to overestimate the importance of this question, on which, to a very great extent, the future of architecture depends. There must be unity of idea and certain broad principles recognised by all. Let us come to some agreement on these principles, even if the result falls short of what is required.

THE DOME OF THE INVALIDES.

Jules Hardouin Mansart may be rightly regarded as one of the favourites of fortune, if only by reason of his connection with two of the greatest architectural monuments of his time and country, namely, the immense palace of Versailles, and the beautiful dome of the Hotel des Invalides, in Paris.

Born in the year 1645, Mansart was the descendant of an ancient Italian family which had already produced several generations of men more or less distinguished in art. He received his early training from his uncle, Francois Mansart, an able architect, whose reputation has been unjustly overshadowed by that of his more fortunate nephew.

Desirous, as he was, of making his reign renowned for the patronage of art and the encouragement of culture, Louis XIV. ("Le Roi Soleil") had need of the co-operation of a man of genius who could at once initiate, and carry to a successful conclusion, architectural projects conceived on the most ambitious scale. Shortly after Mansart first attracted the monarch's notice by the ability he displayed in the erection of the Chateau de Clagny (1676-1680), built for Madame de Montespan and her children, "les enfants naturels du Roi," he was entrusted with the work involved in the design and erection of some of the most important public edifices of his time. Among many architectural works of great merit designed by Mansart, the dome of the Hotel des Invalides is, without doubt, his greatest success, and the Maison de S. Cyr, commenced in 1685, for Madame Maintenon, and the Place des Victoires, Paris, are also worthy of special mention.

But his labours and responsibilities did not end here, as, in addition, for between thirty and forty years he had the absolute control of the principal building works carried out by Louis XIV. at Versailles.

Owing, in the main, to the energy and zeal with which he gave effect to the instructions of his royal patron, not only was Mansart successful in retaining, for many years, the confidence and respect of the King, but he was enabled to amass an immense fortune and to become the deserving recipient of innumerable honours and distinctions.

L'Hotel Royal des Invalides is the largest and the best work of its well-known architect, Liberal Bruant. Its magnificent court, reminiscent of the cortile of an Italian palace, is enclosed by some finely-designed buildings, distinguished for the purity of their architecture and the grandeur of their proportions. It appears that the addition of a dome was never contemplated by Bruant, and so, when the proposal to embellish his vast pile of buildings by the erection of a dominant feature was suggested, it was found that it could only be placed at the extremity of an existing building—that of the church attached to the institution. For this reason Mansart's cupola forms, practically, an isolated structure, and being, thus, unable to make it anything more than an addition to a church already built, he was compelled to design a special entrance front (approached from the open country by which, at that time, the buildings were partially surrounded) to accord as far as possible, in architectural scale, with that of the adjoining buildings.

Recognising these limitations of design, the composition of Mansart's facade formed of two Orders placed one above the other, must be adjudged successful. The plan of the structure forms a square in the angles of which are four small circular chapels, and in the centre a lofty dome, of which the lower portion, octagonal in shape, consists of four archways, forming the longer sides of the figure, its shorter sides being represented by four massive piers, pierced centrally by vaulted passages leading to the circular chapels. The large pendentives of the dome are decorated with paintings of the four Evangelists by De la Fosse, and above is the drum with its range of coupled Composite pilasters, between which are twelve segmental-headed windows.

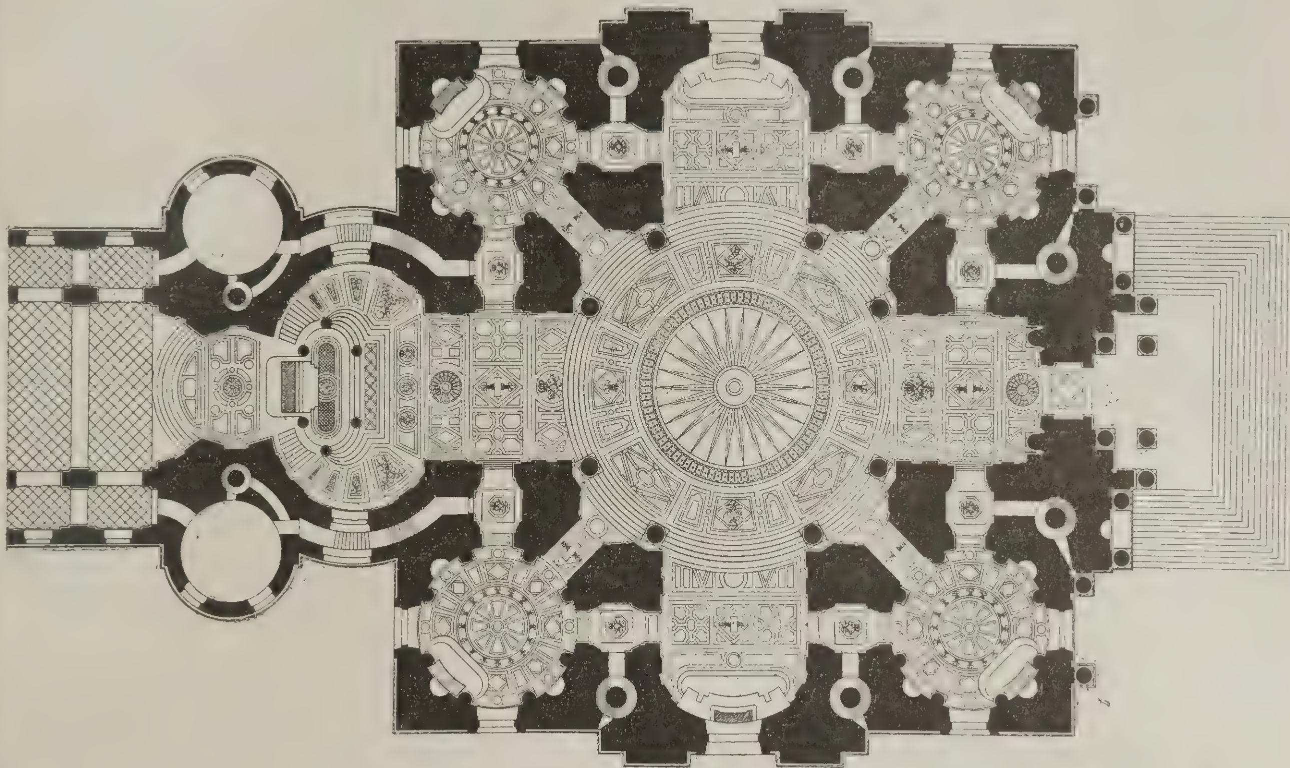
Reference has already been made to the unusual construction of the apparently massive piers that carry the dome, but it is in the results obtained by the use of vaults of triple section (of which the two internal ones are of stone and the external one of wood) that Mansart's originality is best exemplified. The lower vault, truncated to form a large circular opening or well for light, is decorated with wide panelled ribs, responding to each group of coupled pilasters in the drum below, the intervening spaces being ornamented with paintings. Rising well above the circular opening of the lower vault is the crown of the middle one, which has a finely painted fresco composition by De la Fosse, of Christ, the Blessed Virgin, and S. Louis, forming a very happy finish to the internal decoration of the building.

Lunettes, concealed by the lower vault, admit light to the interior, through the large well, in an extremely effective manner.

Externally, the dome consists of a stylobate, a drum embellished with coupled columns of the Corinthian Order, and a pilastered attic storey with console-shaped buttresses, above which rises the graceful contour of the timber-framed dome, terminated by a lantern, and ornamented with trophies of gilded bronze.

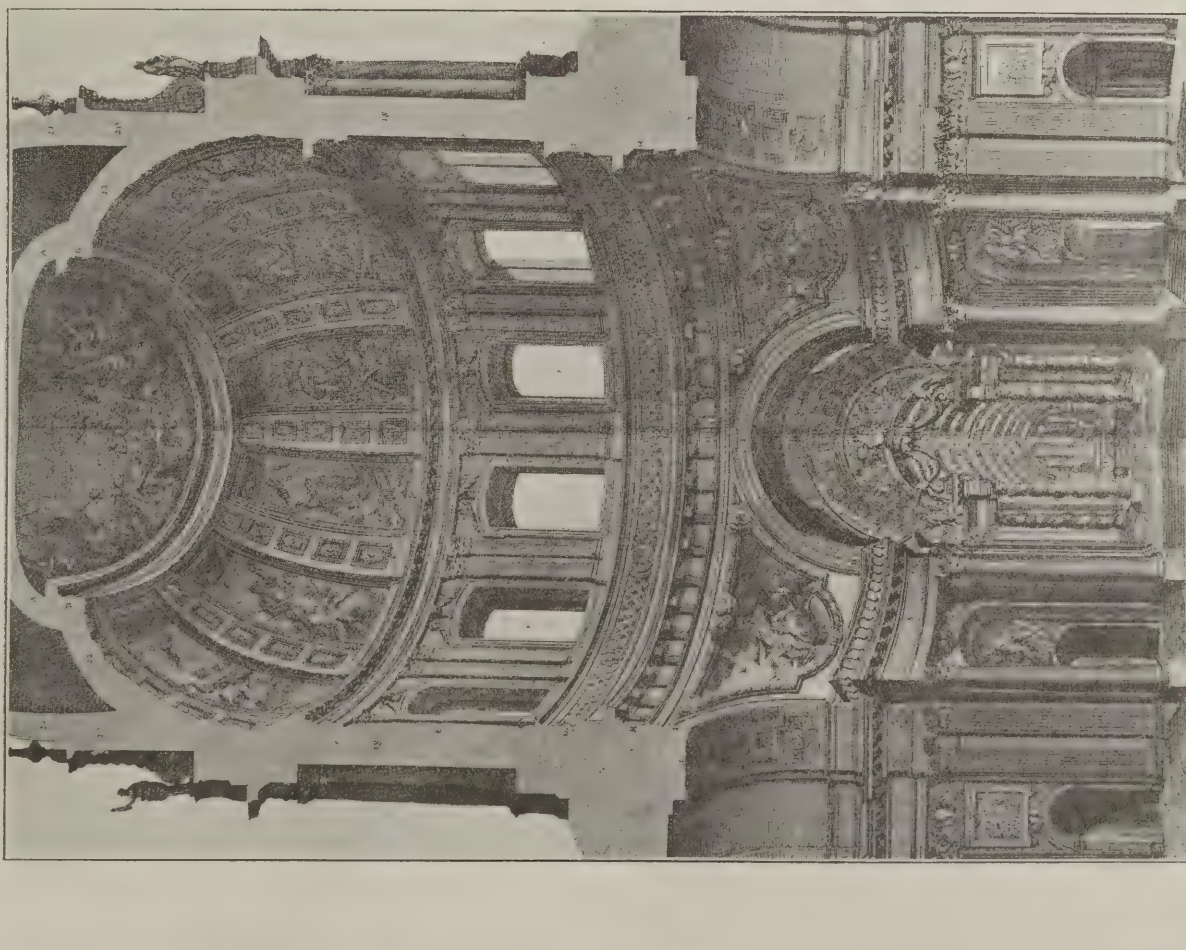
The total height of the structure from the pavement level to the top of the cross is about 338ft.

HOTEL DES INVALIDES, PARIS: SCULPTURE IN THE SANCTUARY, WITH CONSOLE BETWEEN THE FIGURES.



Ground-Floor Plan.

HOTEL DES INVALIDES, PARIS.



Cross-Section Showing Dome Supports.

Sculpture in the Chapel of St. Therése.

Sculpture in the Chapel of the Holy Virgin.

HOTEL DES INVALIDES, PARIS.

HOTEL DES INVALIDES, PARIS: CROSS SECTION.

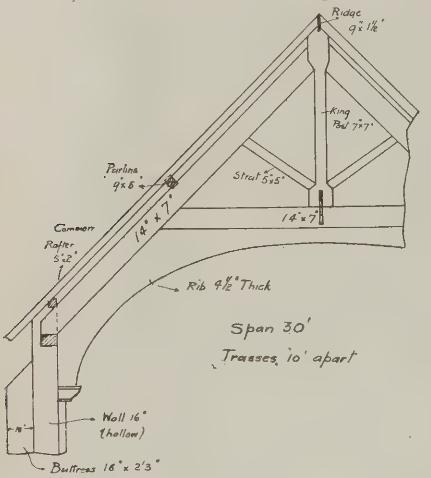
Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

Collar-Beam Roof Truss.

X. writes: "I shall be glad to know whether the roof shown on the accompanying sketch (not reproduced) is constructionally sound and satisfactory. It is proposed to ceil in with plaster on the underside of common rafters and collars. The roof would be boarded, felted, battened, and tiled. All timbers to be deal."

The scantlings of a collar-beam truss cannot be calculated with accuracy, as the stresses depend on the resistance to thrust afforded by the walls. The principal scantlings shown in your sketch are considerably too light, and should be increased; those shown in the figure below



are more suitable. This type of truss is scientifically bad, but possesses advantages from its appearance. The absence of a tie-beam necessitates the strengthening of the walls by means of buttresses, in order that the horizontal thrust may be taken. The figure shows the scantlings for the trusses at 10ft. centres, instead of 15ft., as suggested by you. If it is necessary to keep the 15ft. centres, the scantlings should be proportionately increased and the walls more strongly buttressed. For the scantlings given, a buttress should be added as shown. If you wish to determine the stability of the walls you should proceed as shown in an answer to an enquiry on p. 164 of THE BUILDERS' JOURNAL for February 19th last.

A.

Extension of Sunday School on Burial Ground.

A.I.R.B.A. writes: "I am asked to advise with regard to an extension of a nonconformist Sunday school building. The only available land is now a disused graveyard surrounding the building. What steps should be taken as a commencement? (1) Presuming permission can be obtained from grave owners, could the site be covered with concrete and built upon, leaving graves undisturbed? (2) If not, is there any alternative to an order from the Home Secretary to remove coffins? (3) Please give some idea of the cost of No. 2, if necessary."

Under section 25 of the Burial Act, 1857, in order to obtain exhumation of a dead body, except where the body is removed from one consecrated place of burial to another, by faculty granted by the Ordinary for that purpose, a licence of the Secretary of State is required. It appears that when a body is buried in consecrated ground a faculty is always required for its removal, for whatever purpose. Then, cemeteries which have once been consecrated are for ever removed from ordinary secular uses, and a company or sanitary authority acting under the powers of the Cemeteries Clauses Act may not sell or dispose of any land which shall have been consecrated or used for burial (10 and 11, Vict., C. 65, S. 9). This protection, however, was not extended to unconsecrated cemeteries generally until the year 1884, when an Act was passed prohibiting the erection upon any disused burial ground of any building, excepting for the purpose of enlarging a *church, chapel, meeting-house*, or other place of worship (47 and 48 Vict., C. 72, S. 3). As to your first question, i.e., covering the site with concrete and leaving the graves undisturbed, this would depend upon the time since the last interment took place, and the general sanitary conditions of the site. The Home Office may sanction the removal of a certain amount of the surface and the construction of a concrete raft upon which the building could be erected, but legal advice should be obtained. (2) See definition of the Act already given. (3) The cost of removal of human remains would depend principally upon the distance they would have to be conveyed for re-interment. I should say from ten to twenty shillings per body, exclusive of the cost of re-interment. Then to this must be added the legal and other expenses.

ALBERT C. FREEMAN.

Decorative Repairs.

LEEDS.—DECORATOR writes: "In deciding on dilapidations, does papering come under the head of 'Decoration' or not? The clause in the agreement reads as follows:—'To maintain the inside of the premises, but shall not be under any obligation to re-decorate on expiry of tenancy, but shall make good any damage caused by unfair treatment.'"

Certainly painting, papering, and whitewashing are all decorative repairs, but I think you are laying more stress upon the *portion* of the repairing clause which you quote than it should rightly bear. You do not give the context or quote the whole of the repairing clause, but I may mention that a tenant "maintaining the inside of the premises in tenantable repair" is only bound, in any case *during his term*, to do such painting, papering, and whitewashing as is absolutely necessary to preserve the premises from decay, and to fit them for a tenant of the usual description. It follows, therefore, that on quitting, a tenant's liability under such conditions is very light indeed, even were the special clause you quote not inserted in the instrument of tenancy. In this case, I think the outgoing tenant is practically liable for nothing except for the "unfair treatment" mentioned.

X.

Price per Foot Cube for Hospital.

LONDON.—"FENESTRUM ORALIS" writes: "I should be glad to know at what price per foot cube to take a modern general hospital; and whether the wards, administrative block and laundry, etc., should be at the same price. Also, how much per bed some recent examples have worked out at."

It is difficult to price a hospital without seeing the drawings and knowing all the circumstances, but the wards and other comparatively open parts could be done for 1s. per cubic foot, and the administrative block for 1s. 3d., down to 25 per cent. less, depending upon the character of the work. The rate per bed may vary from £250, which was the cost at St. Thomas' Hospital, to £50, which would be a very reasonable rate.

HENRY ADAMS.

Rendering Wood Non-Flammable.

LONDON.—GREENHOUSE writes: "What solution is used to make teak doors more fire-resisting, and by whom is it sold? Can you give me the names of some firms who would treat the wood?"

I never heard of hardwood teak doors being treated with non-flammable solution. Soft woods are treated with solution, and these are impregnated by the process of the Fire-Resisting Corporation, Ltd., Townmead Road, Fulham, to whom you could apply for particulars.

S.

Model of the Pantheon.

EWELL.—INTER writes: "Where can a model of the Pantheon at Rome be seen?"

So far as we know there is no model of the Pantheon at Rome to be seen in London.

Straight-Line Formula for Stanchions.

EDINBURGH.—R. writes: "What is the straight-line formula for the strength of columns and stanchions, and how does it compare with the Gordon-Rankine one for accuracy? Would the formula $\frac{W\,L}{80}$ give a sufficiently accurate result for a distributed load over rolled steel joist for examination purposes? If not, please state one."

There are several straight-line formulæ for strength of columns and stanchions, all of which are approximately true. One of the writer's straight-line formulæ for mild steel stanchions, ends fixed, is:—Safe load lbs. per sq. in. $=8{,}000\left(\frac{100-R}{100}\right)$ where R = length in ins. ÷ least diameter. Another, more accurate but more troublesome to use, is.—Safe load lbs. per sq. in. = 10,000. $-33\frac{l}{r}$ where l=length in inches, and r =radius of gyration in inches. Taking for example a built-up steel stanchion composed of two 8 in. by 4 in. by 25lb. rolled steel joists and two 10in. by ½in. plates, giving a sectional area of 25 sq. ins., and radius of gyration 3ins., the safe load by the above rules would be 57.5 and 67.4 tons respectively, while the Rankine-Gordon formula would give a safe load of 107.5 tons, and the most reliable formula at present known (Fidler's) gives the safe load at 67.75 tons. The formula $\left(\frac{W\,L}{8\,D}\right)$ gives the stress in tons in an equal-flanged girder, and will apply to a rolled steel joist. It does not agree exactly with the tabular value of a rolled joist, as it does not take into account the assistance of the web, but it is near enough for examination purposes. For example, a 8in. by 4in. by 25lb. rolled steel joist on a span of 12ft. will carry eight tons with a maximum stress of eight tons per sq. in. Each flange is 4 x .56 =2.24 sq. ins. area; then $\frac{W\,L}{8\,D}$ = "D" A×8, whence $\frac{8\,A \times 8\,D}{L} = \frac{8 \times 2.24 \times 8 \times \frac{2}{3}}{12}$ = 7·9, say, 8 tons safe load.

HENRY ADAMS.

RAILWAYS AND THE BUILDING TRADE.—III.

By H. Morgan Veitch, *solicitor to the Joint Railway and Parliamentary Committee of the "Perishables" Trades.*

(Continued from p. 211, No. 682).

In considering, in somewhat more detail than hitherto, the principal grievances of the traders of this country in their dealings with the railways, it may be convenient in the first place to deal with the vexed question of

Owner's Risk Contracts.

Most readers are probably aware that railways are compelled to carry goods (with few exceptions) which may be tendered to them. In the absence of any special agreement between the parties, these goods have to be conveyed at "company's risk," which means that the railway companies have to undertake all responsibility in the case of any damage done to the article in transit, unless such damage should arise from any of the following causes:—(1) Act of God; (2) act of the King's enemies; (3) inherent vice of the goods carried (e.g.:, a horse which injures itself by vicious kicking); or (4) inherent tendency of the goods to decay or ignite.

In conveying the goods upon these terms the company are, as explained in the second article, entitled to charge such rates as may be in force for the time being in respect of the particular "class" in which the goods are placed. This liability was imposed by statute many years ago. In course of time the railway companies became desirous of minimising their risk in this respect, and accordingly they held themselves out as being prepared to carry most goods at a lower rate, provided the trader was willing to sign a special form of contract, known as the "owner's risk" note, by the terms of which the risk of damage is borne by the trader instead of by the railway company.

As a matter of fact, in recent years, traders in many branches of commerce have had little or no option in the matter, because, in these competitive days they find that the cost of sending at company's risk is more than the trade will bear, and therefore, if they are to compete with current market prices, they can only do so by sending their goods at the lower cost involved under owner's risk conditions.

It is, of course, obvious that the trader who thus consigns at his own risk cannot expect the railway company to assume the same responsibility as if they received the higher charges involved in transit at company's risk, and traders agree that under the former conditions it is perfectly right and proper they should take upon themselves all

Reasonable Risks.

They contend, however, that even under owner's risk conditions the trader ought not to be compelled to bear loss arising from damage caused by actually unreasonable treatment of the goods at the hands of the railway company's servants. In other words, that in cases of "gross negligence" the railway company ought not to be allowed, in any circumstances, to throw the loss upon the trader.

As the law stands at present, the railway companies are able to disclaim liability, unless, at all events, the trader can prove that the goods have been damaged by the "wilful misconduct" of the servants of the railway company. Here we find

One of the Chief Difficulties

involved in this question, because, obviously, it is impossible in most cases for the trader to prove anything of the kind. He does not accompany the goods, and is not present to see what occurs during their transit; in fact, as a member of a well-known firm recently remarked—"To take an extreme instance: if the railway employees chose to amuse themselves by dancing on the goods, we should be perfectly helpless in the present state of the law. The consignment may arrive in a mangled state, but to obtain compensation we have to prove wilful misconduct, and as the porters or their friends would usually be the only witnesses, such a task is of course impossible." This statement of the case is perfectly correct, and there are many instances of the kind to be found in the law reports.

In a letter recently written to the "Daily Telegraph" by Mr. R. E. Moore, the well-known counsel and arbitrator, it is pointed out that if the companies refused to accept liability, even in the case of wilful misconduct of their servants, it is still a moot point in law whether they could be prevented from so doing.

In justice to the railway companies it should be stated that for many years several of the companies refrained from enforcing their strict rights in this connection, but more recently the situation has been materially altered, to the detriment of the trader, by the formation of what is known as

The "Joint Claims Committee"

of the combined railway companies. In the present circumstances, practically all claims for damage to goods have to come before this joint committee, with the result that very few claims are now paid unless the facts show that the trader could successfully bring an action in support of his claim by proving "wilful misconduct." The more reasonable companies are thus being rapidly pulled down to the level of their less reasonable or more jealous competitors.

Speaking to the writer recently, the head of one well-known firm which supplies the building trade said: "The treatment which we now receive at the hands of the railway companies in respect of owner's risk claims is simply wicked. Under the old state of affairs we had very little trouble in this connection. All claims arising from any unreasonable treatment by the servants of the railway companies were met promptly and fairly, and the inspector sent to investigate claims usually paid amounts up to, say, 50s., without even having to refer the matter to headquarters. But now all this is changed. Claims have to come before the Joint Claims Committee, and the result is almost invariably unsatisfactory." As a matter of fact, the writer knows an instance in which a dozen members of the Joint Claims Committee invaded a trader's premises in a body, seeking to tackle him on the subject with a view to escaping liability! Here, again, we see the adverse conditions which are being created by the tendency of the railways to combine, and, in effect, to create such a situation as one might expect to result from a virtual monopoly.

The Difference between Company's Risk and Owner's Risk Rates.

There is another aspect of this question which also causes great dissatisfaction amongst the mercantile community. As explained above, under owner's risk conditions the trader pays a lower rate and takes practically all the risk, even such as may arise from the "gross negligence" of the companies' servants, while, under company's risk conditions the trader consigns his goods at the high rates now in force, and the company takes the risk except in the case of the four instances cited at the commencement of this article. The question arises as to whether the difference charged between the rates under these two distinct conditions is a reasonable one.

It will be seen that the question of liability practically turns upon who is to bear the risk; that is to say, upon whose shoulders is to fall the cost of what, in effect, amounts to "insurance." If the goods receive reasonable treatment in transit, the cost of this insurance should not be very great; in fact, when giving evidence recently before a departmental committee on fruit culture one railway witness stated his conviction that a difference of 5 per cent. to cover the cost would be about right. The witness presumably had in mind the question of an "average" of 5 per cent., as one could not expect a railway company to carry a brittle or perishable article as cheaply as one which, by its nature, might be practically unbreakable. Certain goods should, for instance, be consigned at owner's risk rate, coupled only with an additional charge for "insurance" of 1 or 2 per cent.; other goods which, by their nature, are more liable to damage, might have to bear an extra rate of 5 per cent.; while on those peculiarly liable to damage might be imposed an extra "insurance" rate of 10 or, for the sake of argument, even 15 per cent., the matter being so arranged that, taking the general average of all articles combined, the extra remuneration to the railway company would work out at 5 per cent. on the whole. This method was no doubt what the witness had in his mind.

In actual practice, however, the difference is often remarkable. One of the largest firms of builders' merchants in London states that the difference between owner's risk rate and company's risk rate sometimes works out as high as 33 per cent., and further enquiry into this subject would probably result in instances coming to light where an even greater difference is charged.

The Baneful Effect of High Rates.

Those who have given attention to the matter on behalf of the mercantile community contend very strongly that excessive rates are not only hurtful to the trader by reason of the stifling effect which they have on trade, but that in the long run they are equally hurtful to the railway companies themselves. Mr. George Monro, of Covent Garden, for instance, gives a very good instance in support of this view. A short time ago the fruit growers of Guernsey found themselves seriously handicapped by the rates charged for the conveyance of their produce to the London market. An additional charge of 1d. per package proved to be "the last straw," and owing to the fact that the London and South Western Railway Company and the Great Western Railway Company had entered into a "working agreement," the Guernsey growers came to the conclusion that it was of vital importance for them to seek some other means of transit. Accordingly they joined together and formed what was known as the "Guernsey Mutual Transport Company," for the carriage of their produce, and in the first eighteen months of the venture this company took no less than £20,800 for freight, every penny of which came out of the pocket of the railway companies.

Again, quite recently, hundreds of acres of land in Lincolnshire devoted to

potato-growing went out of cultivation owing to the railways raising the rates beyond what the trade could bear.

These instances arise, of course, in connection with quite another branch of commerce to that of the building trade, but the rule would equally apply to other goods, and, consequently, the subject is one which cannot be treated with indifference by any section of the mercantile community.

In conclusion, it may be well to call the attention of readers to the fact that Mr. Lloyd-George has now announced his intention of enlarging the number of delegates to the present Railway Conference, as well as of appointing several sub-committees, consisting partly of existing members and partly of others, to consider and report on certain groups of questions, especially as to the conditions created by working agreements, combinations, and amalgamations of railways. It would obviously be to the interest of the building trade to be represented on some of these sub-committees, and no time should be lost in classifying its peculiar difficulties and preparing adequate evidence in proof of them.

(*To be concluded.*)

A GARAGE ROOF.

In a paper on "Garages and Motor Houses" read before the Architectural Association (see THE BUILDERS' JOURNAL for February 12th), Mr. Harrison Townsend mentioned the garage built for the London Motor 'Bus Co. (Vanguard) at Hackney, making special reference to the roof over the garage proper. Herewith we give some illustrations of this roof.

The architect for the whole scheme, covering about $1\frac{1}{2}$ acres, and comprising the administrative block, the works and engineering departments, as well as the garage itself, was Mr. H. Yolland Boreham, of 73 and 75, Finsbury Pavement, E.C. The general contractors were Messrs. Dove Bros. and Messrs. Perry and Co., while the steel construction to the garage was carried out by Messrs. Peirson and Co., of St. Dunstan's Hill, E.C., whose new departure in roof construction for large spans was adopted as being the most suitable for this special work.

The roof consists of steel lattice girders and trusses on the cantilever principle, dispensing entirely with the necessity of any supporting columns. No internal supports whatever are required, as the framework of the roof is self-supporting. The principal girders of the roof are built into the framework of the trusses themselves, and become part of these, instead of distinctive separate girders, as in ordinary construction. There are no outside projecting girders, and, consequently, the valley gutters have a clear unobstructed run, enabling them to be made of exceptional width for easy passage for cleaning and repairs. Internally the girder does not project below the tie bar (as is frequently found in ordinary construction), thus securing the necessary headroom at a considerable saving in height on the surrounding brick walls.

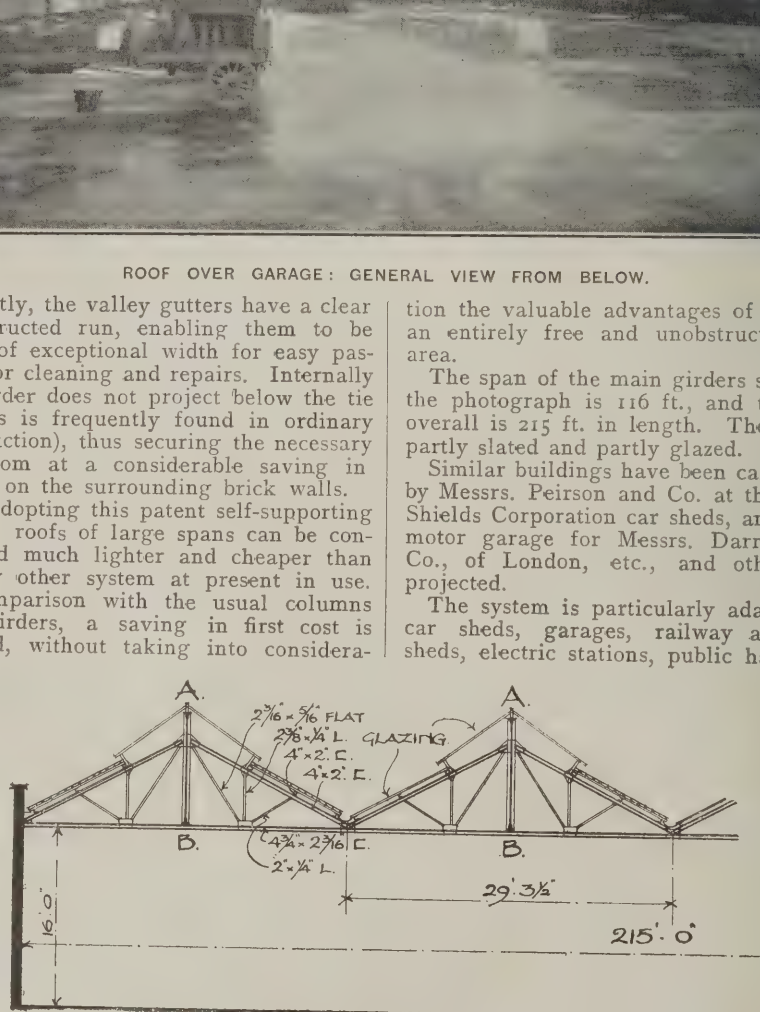
By adopting this patent self-supporting system, roofs of large spans can be constructed much lighter and cheaper than by any other system at present in use. In comparison with the usual columns and girders, a saving in first cost is effected, without taking into consideration the valuable advantages of securing an entirely free and unobstructed floor area.

The span of the main girders shown in the photograph is 116 ft., and the shed overall is 215 ft. in length. The roof is partly slated and partly glazed.

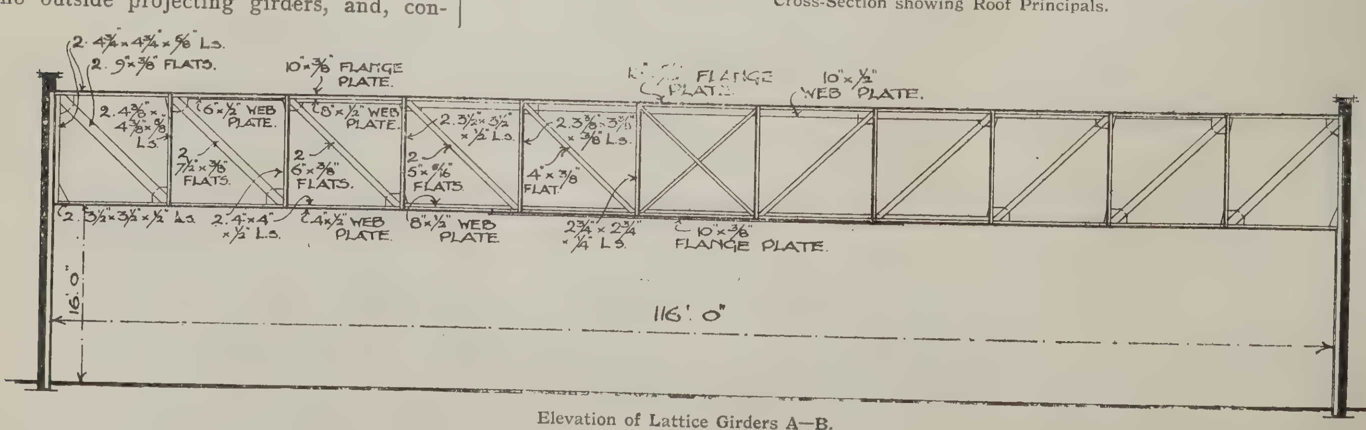
Similar buildings have been carried out by Messrs. Peirson and Co. at the South Shields Corporation car sheds, and at the motor garage for Messrs. Darracq and Co., of London, etc., and others are projected.

The system is particularly adapted for car sheds, garages, railway and dock sheds, electric stations, public halls, etc.

ROOF OVER GARAGE: GENERAL VIEW FROM BELOW.



Cross-Section showing Roof Principals.



Elevation of Lattice Girders A—B.

ROOF OVER GARAGE FOR THE MOTOR 'BUS CO., LTD. (VANGUARD), HACKNEY, LONDON, N.E. H. YOLLAND BOREHAM, ARCHITECT.

Correspondence.

Excess Railway Rates on Building Materials.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—As ex-president of the Manchester and District Builders' Merchants Association, and also as one who has been connected with the trade in Lancashire and Yorkshire for the past 35 years, I think I may fairly claim to have some little knowledge of the above subject.

About a year ago I, together with the president of the Liverpool Association, gave evidence as to the amending of the bankruptcy laws in connection with the building trade, also as to undue preference given by the railway companies to foreign merchandise.

I import cement from the Continent to Burnley, via Goole. The through rate for conveying this traffic, a distance of 420 miles, is 11s. 2d. per ton, *i.e.*, from works to Antwerp 90 miles, Antwerp to Goole 283 miles, and Goole to Burnley 47 miles. For cement or plaster carried on the home railways, say, from Staffordshire (Tutbury), a distance of 57 miles only, the rate is 7s. 1d. per ton, and from Manchester to Burnley, a distance of only 28 miles, the rate is 7s. per ton. Why should there be this vast preference? Whilst the legal charge on the home railways is $1\frac{1}{4}$d. per ton per mile for most materials, with a minimum weight, and terminal charges in addition, it very rarely happens that you can get a rate on these bottom figures; generally it is much in excess of this.

I may also remark that general delay throughout the three counties occurs where I have occasion to consign goods. Often it takes a full wagon load a week or ten days to travel from, say, Nantle (North Wales) to Manchester, and, again, full truck-loads from Bacup to Manchester take five or six, or even eight, days in transit, while only recently a truck was left in the sidings at Facit for three weeks; also, in October last, a truck of bricks consigned to me from a Midland station was detained by that company for three days before being despatched, with the result that I lost the order, and when I passed a claim to the company they, after a lapse of time, offered me as a solatium a sum of 20s. as out-of-pocket expenses, qualified with the stereotyped remark, "without prejudice."

Similar instances to the above are occurring daily.

Is it not time some alteration should be made by which the railway companies could be held liable for damages for unnecessary delay?

Then, again, as to owner's risk conditions and compensation for damage through careless handling of goods. I consider this should receive very serious consideration. Here are a few instances in reference to same. I receive cement, which is chargeable at Class C rate, and have received several bags in a damaged condition, through imperfect covering by the railway company, and when a claim is submitted they repudiate liability. My neighbour, whom we will class as a miller, receives flour (which is also classified under the same head, and is received in a damaged condition, through defective sheeting), also submits a claim, and his claim is recognised. Again preference is shown. I have in my mind another case where a firm in the immediate vicinity send traffic away and consign at owner's risk; should same be damaged they submit a claim, and the railway company endeavour to cover themselves by the owner's risk rate, but ultimately meet the firm in settlement. This settlement is made consequent on their doing a large business with the company and under threat to divert traffic. Here you have another injustice to the small trader.

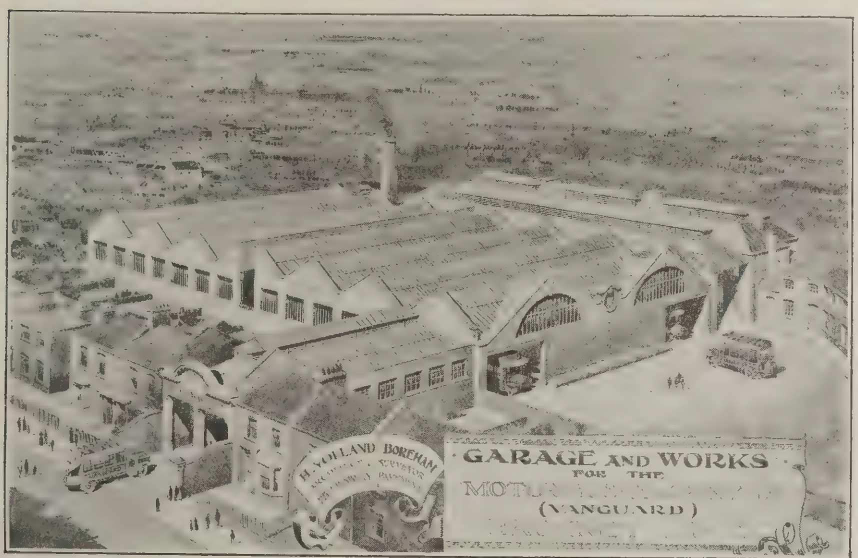
I hope the time is not far distant when the Government will step in and take the matter in hand for the nationalisation of all railways. Then, and not till then, may we expect equal justice being meted out to all.

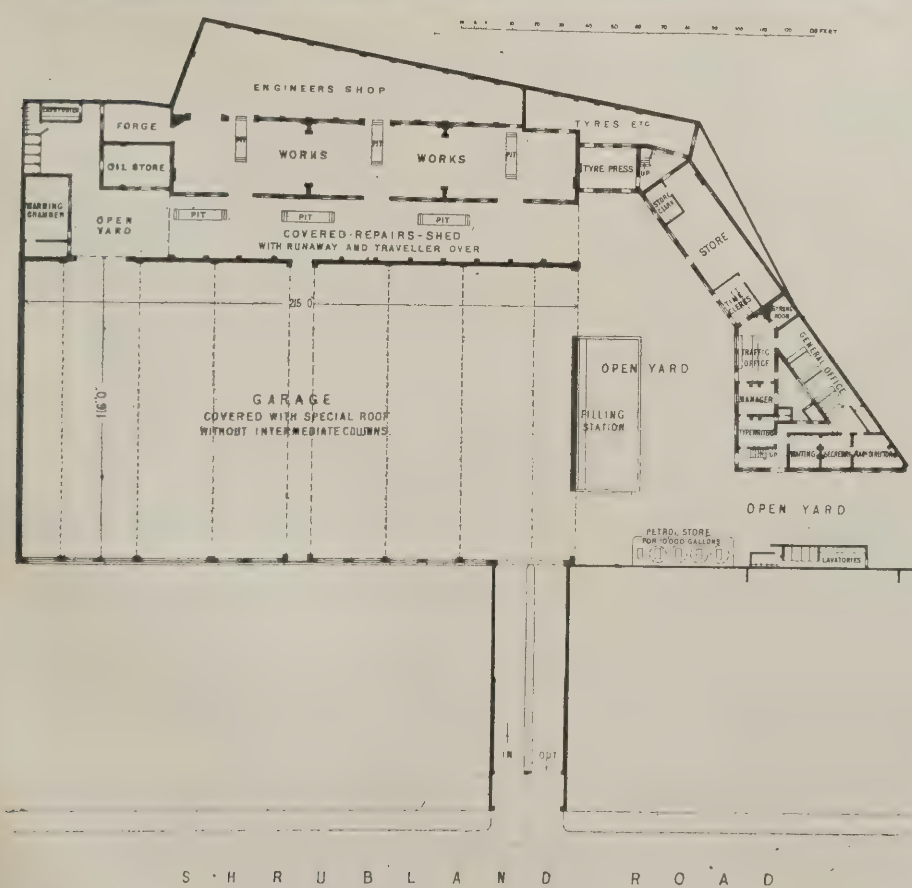
I trust you may receive some strong reports from my brother merchants.

Yours truly,

W. RADCLIFFE.

Manchester.





The London County Hall Competition.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Kindly permit me to supplement my remarks in your issue for March 4th by referring to the levels of the accepted design.

Mr. Knott adopted the datum line as the level of the basement floor, with a slight drop below that line to the floor of internal courts.

The main sewer invert is 1.24 and 0.46 *above* datum, thus making natural drainage quite impossible.

By what conjuring trick are these reverse drainage conditions to be met, especially when the head of the whole flow in a 4-ft. sewer is taken into account?

Schemes by eminent competitors provide for basement and court floors *above*

the top of the main sewer, with due allowance for drain fall, thus adding greatly to the cube and cost of the building above the concrete rafts.

This question of levels decides largely the possibility of direct entrance from Westminster Bridge to the principal floor on which Mr. Knott depends.

I do not, therefore, raise a point on trivial detail, but of vital principle in the scheme.

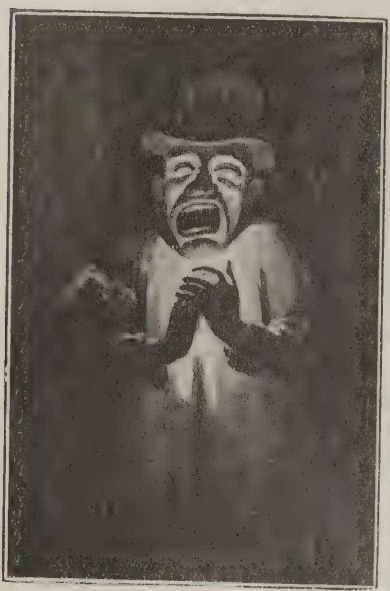
Yours truly,
Morecambe. CHARLES CRESSY.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—I understand you invite comments on the County Hall competition.

Herewith please find *my* modest comment upon the winner's plan.

I enclose my card, and remain,
Yours faithfully,
"IN THE DARK"



LONDON COUNTY HALL: ENGINEERS' CORRIDOR, MID-DAY. "LOST"
"O day and night, but this is wondrous strange."
—*Hamlet, Act 1, 5.*

Notes on Competitions.

New Council Offices, Radcliffe, Manchester.

In his report on the fifty-five sets of designs submitted in this competition, Mr. G. H. Willoughby, F.R.I.B.A., the assessor, says:—"In my opinion there were certain points to be striven for, and which I have steadily kept before me, as being essential to securing the 'best' and most suitable scheme, namely:—(1) That the conception of the design, both with regard to its cubical contents as well as its architectural arrangement and clothing, should be one that can without doubt be substantially erected and finished in its entirety—including furnishing—for the stipulated outlay, or within 5 per cent. of the same. (2) That in dealing with the somewhat restricted site, the best 'possible' use should be made of the same by bringing the structure right up to the building line on all sides, without breaks, thus increasing the size of the internal courts, also adding light and air to same, and obtaining the maximum amount of superficial floor space for the accommodation to be provided. (3) That as little lighting as possible is dependent upon 'internal areas,' but that an abundance of direct daylight is secured to all working rooms, corridors, etc., by the provision of large square-headed windows carried close up to the ceiling. The fewer internal areas any building has the better for light, health, and cleanliness, and these should be as large as possible for air and drainage. (4) That the allocation and sequence of the working offices for the officials should be such as will permit of inter-communication by their occupants with the least possible delay. The council chamber should be planned so as to be easily and expeditiously reached by the members (without having to traverse corridors) direct from the main entrance and staircase, perfectly lighted and ventilated, and with suitable cloak-room and lavatory accommodation contiguous to same—preferably away from the street. All corridors and passages should be as direct and short as possible, compatible with the expeditious and efficient working of the building. (5) That in a public building of this character the principal entrance and staircase should be made a feature and emphasised externally—bold and dignified in its conception—the staircase having easy risers and broad treads (without curves or winders), and amply lighted, preferably direct from the open rather than dependent (as are so many designs submitted) on the doubtful lighting of an internal area. (6) That the police court should have top light, and be lighted from both sides, the average court of to-day being dingy and wanting in light, and—most essential—adequate 'cross' ventilation should be provided. Suitable supplementary rooms for the magistrates and legal advocates and witnesses, with separate entrances and conveniences to each, should also be arranged. (7) All w.c.'s, lavatories etc., to every floor should be arranged en suite one over the other, and kept entirely away from the principal facades, and, where possible, directly lighted and ventilated from the open rather than internal areas."

As announced in our issue for last week, the awards in this competition are:—1st, Mr. W. M. Gillow, of Manchester, and Mr. R. Holt, of Liverpool (joint architects); 2nd, Mr. David Bird, of Manchester; 3rd, Mr. Henry Lord, of Manchester; 4th, Messrs. F. G. Gilling and G. G. Moorhouse, of Liverpool.

New High School for Girls, Stockport.

Seventy-four applications to compete for this new school were received by the Education Committee. The following have been selected to submit designs:—

Appleyard and Quiggin, Liverpool.
F. Quentery Farmer, Liverpool.
Willink and Thicknesse, Liverpool.
Adshead and Holt, Manchester.
Barker, Ellis and Jones, Manchester.
G. H. Willoughby, Manchester.
Sankey and Cubbon, Blackburn.
H. S. Chorley, Leeds.
Cheers and Smith, Blackburn.
Winder and Taylor, Oldham.
Russell and Cooper, London.
Spalding and Spalding, London.
Sir A. Brumwell Thomas, London.
G. H. Brady, Stockport.
J. T. Halliday, Stockport.
C. Hartley, Stockport.
J. Jepson, Stockport.
C. R. Locke, Stockport.
P. Peirce, Stockport.
W. Swann, Stockport.
Vaughan and Hatch, Stockport.
Wrathmell and Blackshaw, Stockport.
A. G. Wilkinson, Stockport.

The assessor is Mr. J. W. Simpson, F.R.I.B.A., nominated by the president of the Royal Institute of British Architects.

The Abandoned Paper on "The London County Hall Competition."

It was arranged that at the meeting of the Royal Institute of British Architects to be held on April 13th a paper on "The Designs for the London County Hall" should be read by Mr. H. Heathcote Statham, F.R.I.B.A. In view, however, of the highly animated discussion which would be likely to arise, by reason of the dissatisfaction with the award, it has been decided to abandon the idea, and Mr. Statham will now read a paper entitled "A Threefold Aspect of Architecture: Tradition—Character—Idealism," illustrated by numerous lantern slides.

Sunday School, Hartshead, Yorks.

The design for this building submitted in competition by Mr. E. Vincent King, A.R.I.B.A., of Dewsbury, has been accepted by the trustees.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
March 23	ELEMENTARY SCHOOL AT GOSPORT.—Architects desirous of competing should send in their names by this date to George R. Walker, Secretary, Education Committee, High Street, Gosport. Qualifications of, and cost per head of elementary schools erected by, intending competitors should also be stated.
May 15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon, up to March 21st.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDER'S JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
July 31	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date; final competition to be limited to six competitors, by whom designs are to be submitted not later than February 28th, 1909. Particulars from Professor Gollancz, King's College, London.

Obituary.

THE LATE MR E. W. MOUNTFORD, F.R.I.B.A., left estate which has been proved at £23,239.

THE LATE MR. H. A. PROTHERO.—It is proposed that in memory of the late Mr. H. A. Prothero, of Cheltenham, the Chapel of Cheltenham College (his chief work) shall be completed by the erection of the ante-chapel and its surroundings, after Mr. Prothero's own designs.

THE LATE MR. D. R. DALE, F.R.I.B.A., who died recently at Croydon, aged 71, was born in London in 1837. He was articled to Mr. J. Blore, of Brompton Road, who designed many new houses for Addison Road, and that neighbourhood. Mr. Dale carried out many buildings in town and country. In 1882 he was elected a Fellow of the Royal Institute of British Architects, and in 1889 a member of the Court of Common Council of the City of London, for the Bishopsgate Ward; he retired in 1900, owing to ill-health. He was also a member of the Streets Committee of the Commissioners of Sewers, and of the Irish Society. Mr. Franklin Gadsdon, his pupil from 1882, and afterwards his assistant, became in 1894 a partner with Mr. Dale, and now continues the practice.

NEW BATHS FOR ACCRINGTON.—The Baths Committee of the Accrington Town Council have decided to proceed with a scheme for providing the borough with new swimming and slipper baths, at an estimated cost of £9,000.

R.I.B.A.

Bangour Village Asylum.

A meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., the chair being occupied by the president, Mr. T. E. Collcutt.

The deaths of the following members were announced:—George Allen Mansfield, Sydney, New South Wales, elected a Fellow 1873; David Robert Dale, elected a Fellow 1882; and Frank Garfield Johnson, elected an Associate 1904.

Mr. Hippolyte J. Blanc, R.S.A., F.R.I.B.A., read a paper on "A Modern Asylum; Bangour Village, near Edinburgh."

In opening his subject Mr. Blanc touched upon the changes brought about in comparatively recent years by the treatment of the insane. Owing to increased knowledge and study, the old conditions have given place to a greater measure of freedom, to careful nursing under the most perfect sanitary arrangements, and to the selection of situations for buildings having cheerful surroundings.

Instead of the "pavilion and corridor" type, the "segregate or village" arrangement will doubtless be preferred generally for the future, as being more economical to construct and more advantageous both for patients and for the administration.

The estate acquired for the Bangour Village Asylum is about fifteen miles from Edinburgh and twenty-nine from Glasgow, on the same line of railway. It extends to 950 acres, the site occupied by the asylum being about 150 acres. The buildings are disposed in two main groups, (1) The "medical" or "observation," occupying the eastern portion of the site; (2) the "chronic" or industrial," occupying the western. Access is obtained by a road formed from the public highway, nearly midway between the two groups of buildings.

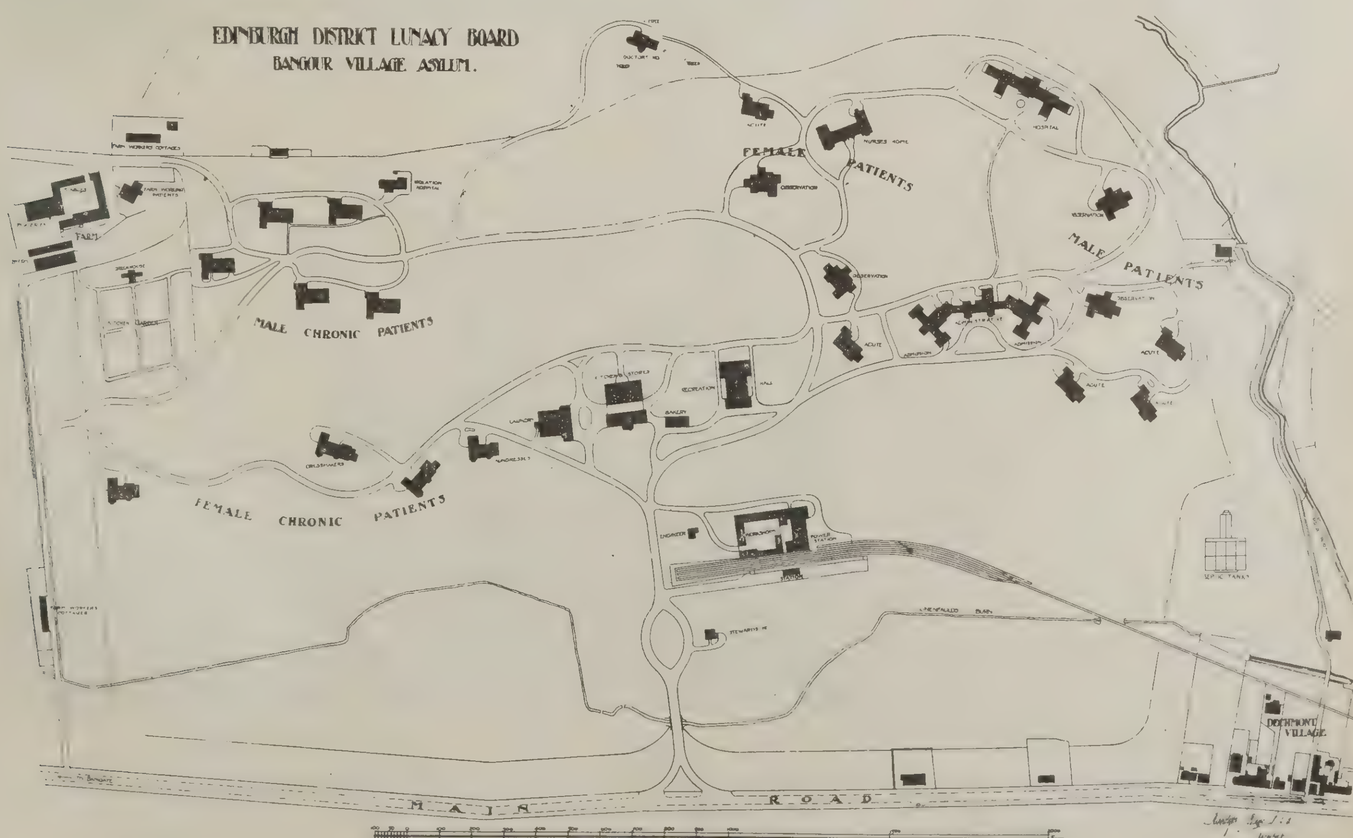
BANGOUR VILLAGE ASYLUM: INDUSTRIAL HOME FOR LAUNDRESSES.

The nearest building, which is well within the estate, is the steward's house, and, continuing, are the power station and workshops, the bakery, stores, and kitchen; also the wash-house and laundry, these being grouped comparatively close to each other, and within 150 yards of the boiler-house, from which steam is supplied to them.

To the right of these are the buildings composing the medical section, and to the left those of the industrial. Of the former there are already erected in a central position the administrative building, to which is attached an admission house for male and female patients—forty of each sex. These are the only buildings erected with corridor connection. Round about these are disposed four "closed villas" for both sexes, nurses' home and hospital.

The chronic, or industrial, section on the western area is subdivided into two groups—one for female and the other for male patients—each having its route of intercommunication, but, as groups, placed widely apart. This western area has erected upon it at present five houses for male and four for female patients, with an ample space for additional homes when required. In the western area a site is retained for a small isolation hospital yet to be built, and at the extreme northwest of the site lie the farmhouse and offices. A greenhouse and very ample kitchen garden—indispensable appendages—find a most suitable site on an extensive slope south of the farm offices.

No boundary walls enclose any of the houses, nor are there fenced areas with garden walls and shrubberies to maintain. All roads and walks are open, as in an



HIPPOLYTE J. BLANC, R.S.A., F.R.I.B.A., ARCHITECT.

ordinary village. There is throughout an absence of the character of an official institution; the appearance is rather that of an ordinary city suburb.

As regards the homes, the accommodation generally consists of day-rooms, dining-room with kitchen and servery adjoining, scullery and store-rooms, lavatory, w.c.'s, boot-room and cloak-room, also nurses' dining-room, all on the ground-floor. On the first floor: dormitories, nurses' room, one w.c., housemaids' pantry, bathroom. A third floor occurs in one or two of the homes where additional dormitory accommodation is required. Each home has its own kitchen and scullery for dealing with any special diet. Each room is provided with two staircases, in simultaneous use, to accustom patients for cases of emergency. Water-closets are fitted in series according to the requirements of the respective homes. The water-closet wing is in height a single storey only, no occupied buildings being built over it. Each, in addition to cross-windows, has an extract shaft carried up in the main gable with electric fan for ventilation.

Every home has its own bathroom, containing one, two, or three baths, according to the number resident, separated by low screens, and with semi-enclosed dressing-boxes.

The homes are each furnished with two boilers, one for atmospheric heating, the other for hot-water supply. All furnace chambers are sunk, and enter from the outside.

A patented arrangement is adopted for the windows, which, under the Lunacy regulations, must not be opened more than 5 ins. The advantage is that no mechanism whatever is visible for patients to tamper with; the sashes being equally balanced, neither ropes, weights, nor counter-check fasteners, nor rods for lowering the top sashes, are required. Moreover, by the equal opening of both sashes, a natural circulation of air is obtained.

The recreation-hall is provided with a large and fully equipped stage, with retiring and dressing rooms. The hall will accommodate 700 persons, with 7ft. super. to each. The orchestra is provided for in a roomy sunk pit in front of the footlights. For dance occasions the pit is covered over at the floor level.

Asylums on the "segregate" principle Mr. Blanc considers more economical to build than those on the "pavilion and corridor" principle. The after-maintenance is also much more simple and economical. Risks of fire are minimised, and if occurring, can be more easily dealt with.

Speaking of cost, Mr. Blanc gave as an approximate total the sum of £237,000 for the 750 patients at present in the institution, which works out at £316 per bed. There is accommodation, however, for 1,000 patients, and when full the proportion of cost would stand at £267 per bed.

A short discussion ensued.

A vote of thanks to Mr. Blanc was proposed by Mr. G. T. Hine, seconded by Mr. William Woodward, and supported by Messrs. Perkins Pick, of Leicester, and Matt. Garbett.

The president announced the next meeting, for March 30th, when a paper will be read by Mr. Hubbard on "Cathedral Churches of Cefalo."

Male Acute Villa.

Female Observation Villa.

Administration Building, and Male Admission Building (on right.)

BANGOUR VILLAGE ASYLUM, NEAR EDINBURGH. HIPPOLYTE J. BLANC, R.S.A., F.R.I.B.A., ARCHITECT.

ARCHITECTURAL GRANITE.

(*Continued from p. 209, No. 682*).

The granites of England, Scotland, Ireland, and Norway have received insufficient attention as regards their strength and other physical properties.

Tests for tensile strength are fairly accurately determined by all experimenters, but the tests on the crushing strength and the shearing strength have not the same reliability. The form of specimens used for conducting compression tests on stone of all kinds, as well as upon concrete, is, as a rule, the cube, but this does not give the true crushing strength of the material. Then again, the difficulty of obtaining truly parallel surfaces in stone has led certain experimenters to use sheets of lead in order to distribute the pressure evenly, but this has given results showing a less resistance than the true crushing strength of the material; the reason for this is that the lead squeezed out under the pressure, and burst the stone by the lateral force developed. Other experimenters have used—some do at this present day—pine boards for the same purpose, but these are even worse than lead and give figures which are much lower than the true crushing strength. The best method, and that which is favoured by the majority of experimenters, is to secure parallel and even surfaces by the applications of a thin layer of plaster of Paris upon the bearing surfaces. This can, of course, be made accurately parallel and even. Professor T. Hudson Beare some years ago conducted experiments to show the approximate reduction of the true compressive strength when using lead or pine boards instead of plaster of Paris, and the results obtained with lead were, for hard stone, more than 50 per cent. less, and pine boards more than 60 per cent. less than the results obtained with plaster of Paris bearing surfaces.

Failure by Shearing.

Stone and granite when tested to destruction under a compressive load fail by shearing on certain definite angles. The resistance to movement along these angles is derived from two qualities: (1) the strength of the material to resist shearing, and (2) the frictional resistance to motion along this plane; and the sum of these two resistances must equal the shearing component of the load imposed when resolved along the shearing plane. The angle of the plane upon which a brittle material ruptures when subjected to compression can be found by equating the two resistances referred to with the shearing force. The determined condition is that this angle shall be that which offers the least total resistance to failure under a crushing load. If the friction is omitted, as the majority of writers do, the angle of rupture is found to be 45 degrees, but if the friction is regarded, the angle of rupture is found to be 45 degrees plus half the angle of repose.

As regards the shearing strength, it is difficult to obtain this experimentally with brittle materials, for there is a probability of introducing bending stresses, but theoretically we should be able to obtain it from the following equation:—

$$p = 2s \tan \theta$$

where p = compressive strength, s = shearing strength, and θ = angle of rupture.

The shearing strength can be obtained in this way from the result of a compression test, and direct experiments upon the shearing strength have well borne out this in practice.

Reason for Adopting Cubes.

The reason for adopting the cubical form for specimens was that the theoretical angle of rupture was thought to be 45 degrees, but since the theoretical angle for stone approaches 60 degrees, the height of the specimen should really be $1\frac{1}{2}$ times the least lateral dimension in order to allow of failure on a normal angle. Professor Bauschinger studied this question very exhaustively, and recommended the following formula.

$$p=\sqrt{\frac{\sqrt{A}}{\frac{u}{4}}}\left(a+b\frac{\sqrt{A}}{b}\right)$$

for all shapes of cross-section and for all relative heights, where

p = crushing strength per unit of area,
A = area of cross-section,
u = perimeter of cross-section,
h = height of specimen,
a and b = constants.

Bauschinger's experiments show that the strength of a stone prism whose height is $1\frac{1}{2}$ times its least lateral dimension has a strength equal to 92 per cent. of the strength of a cube of the same material. Hence when the cubical form is used for test specimens in crushing, the results are 9 per cent. greater than if the proper height of the specimen had been chosen.

Modulus of Elasticity.

The modulus of elasticity is a property which it is important to know in reference to all materials, because it is necessary not only for the consideration of the deflection of beams, but it may affect the ordinary calculation of the strength of beams. It is most important, however, for calculating the strength of a combination of two materials having moduli considerably different from each other; as, for instance, when steel stanchions are embedded in a granite beam, or when a granite beam, arch or dome is reinforced by steel.

Employment of Granite for Carrying Weight

The strength which granite possesses is so great that it deserves to be utilised to carry some weight. The whole of the load in a building should not be carried on stanchions and the granite merely used as a facing, as is so often done in the United States in connection with steel frame buildings. It is true that in this country granite in buildings is, as a rule, called upon to sustain a good part of the loads. We often see, however, stanchions embedded in granite walls, because the granite is insufficient to sustain the load, but instead of the steel being used to reinforce the granite, it is very often called upon to carry the whole of the load. In the calculation of the strength of the two materials in combination, the modulus of elasticity is of the greatest importance, so as to show the relation of the stresses between two materials. In connection with building stones generally, the moduli of elasticity are not determined, and we should be without any facts in regard to British materials if it were not for the very valuable work conducted by Prof. T. Hudson Beare, results of whose experiments were published in a paper on "The Building Stones of Great Britain," in Volume CVII. of the "Proceedings of the Institution of Civil Engineers," for the Session 1891-2.

Effect of Loading on Granite.

Granite, like all building stones, is not a perfectly elastic material. During a first stage of loading, granite appears to be elastic like steel, but whereas the latter has a second stage when the material appears to be ductile, undergoing a certain amount of permanent deformation previous to rupture, with granite (as with hard stones) this ductile period is so close upon the point of rupture that the second stage can scarcely be observed, or, rather, for practical purposes, it must be considered as non-existent. In the first loading, the amount of deformation which granite undergoes is considerable up to the limiting point of the first stage, *i.e.*, practically up to the point of rupture. When the load is removed a certain amount of this deformation is not recovered, *i.e.*, the material is not perfectly elastic and has taken a certain amount of permanent set. With repeated loadings the total permanent set is increased in amount, but is less and less each time, until the point is reached when there is practically no more permanent set, and the material may be considered as perfectly elastic. The limiting point is practically the same whatever may be the alteration in the elastic property of the material. Fig. 1 shows the results obtained by Prof. Beare, and we may quote his remarks in regard to this stress-strain curve of granite: "For the first application of the load the additional strain for each increment of load diminishes as stress increases, the curve is distinctly convex upwards, and on removal of load there is a large permanent set; on reloading, the curve still in general retains its upward convexity, but much diminished, and in some cases the stone becomes almost perfectly elastic, stress and strain being strictly proportionate." It may be mentioned that Professor Beare in his experiments only ascertained this deformation for one repetition of the loading. The reason he did not carry out any more is that he states he found generally that the third application of a load showed very little permanent set. It may be

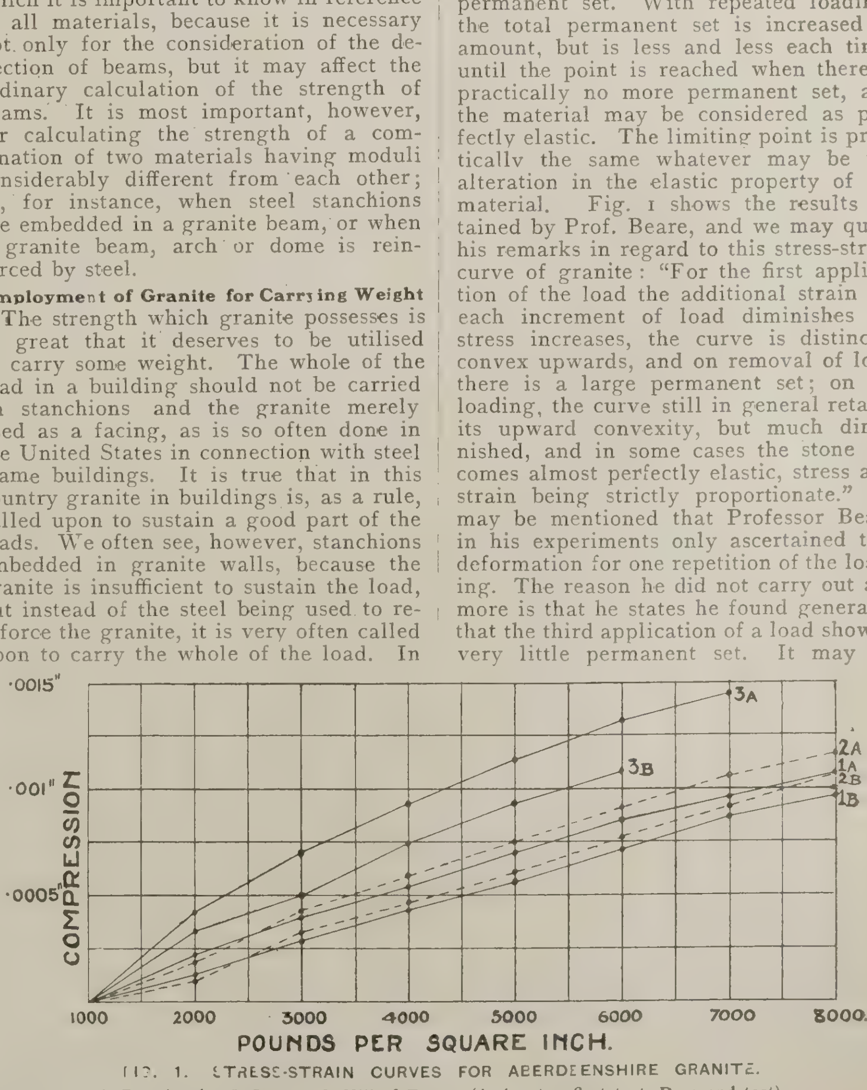


FIG. 1. STRESS-STRAIN CURVES FOR ABERDEENSHIRE GRANITE.
1, Peterhead; 2, Dyce; 3, Hill of Fare. (A denotes first test, B second test).

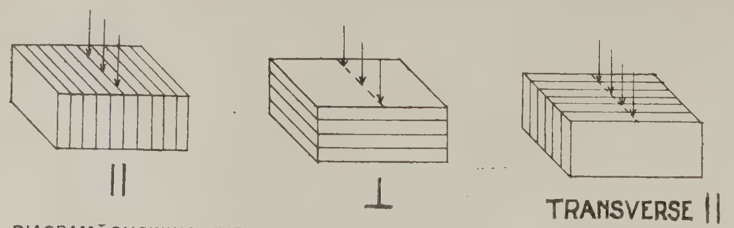


FIG. 2.—DIAGRAM SHOWING DIRECTION OF APPLIED LOAD IN RELATION TO BEDDING.

added in connection with Professor Hudson Beare's experiments that the coefficient of elasticity which he gives was calculated for both series of readings from the definition that the co-efficient $=\frac{\text{stress}}{\text{proportional strain}}$. In the first set of readings the compression for each increase of load consisted of two parts, an elastic and a permanent deformation. The coefficients calculated therefrom are therefore those of the material in its natural condition. The second set of readings refers to the stone after it has been reduced, so to speak, to a state of ease. It may be remarked in connection with the diagram, Fig. 1, that the two values for the coefficient of elasticity do not vary so much as they do with stone. The value of the coefficient for the first test on granite is 479,000, and for the second test 522,100 tons per sq. ft., or 7,450,000 and 8,121,000 lbs., respectively, *i.e.*, about one-quarter of the coefficient of elasticity for steel.

Coefficients.

Prof. Bauschinger found from his experiments that for the hardest stone, and especially limestone, the coefficient of elasticity was nearly constant, equal for tension and compression, and very large for most other stones. The coefficient for elasticity for tension diminishes with increasing loads. For pressure it sometimes increases with increasing loads, but for the weaker kinds it diminishes at first and then increases. Several experimenters have found a difference in the properties of stone and granite when the material was placed so that the stress was supplied parallel to or at right angles to the plane of bedding. When pressure was applied at right angles to the bedding the compression was distinctly smaller than when it was applied parallel to the bedding, thus affecting the modulus of elasticity. Fig. 2 shows these directions clearly.

In connection with the foregoing we shall give, in our next article, a valuable table, setting out the strength and various properties of different kinds of granite.

(*To be continued.*)

EXPERIMENTS ON MORTAR.

In accordance with the scheme of work sanctioned by the sub-committee of the Science Standing Committee of the Royal Institute of British Architects, the work of analysing samples of lime, sand, clay, trass, and pozzuolana, and making the necessary briquettes and blocks for testing the tensile and crushing strength of the mortars made with these materials in varying proportions, is being rapidly proceeded with in the laboratory of Mr. W. J. Dibdin, F.I.C., at Westminster.

The various analyses are now practically complete, and about 700 briquettes and blocks have been made and stored on shelves pending the expiration of the time allotted for the breaking tests. As each set is tested, the results are set out on a series of about eighteen diagrams, the curves thus obtained enabling progress of the work to be watched. The periods during which the several sets of blocks and briquettes will be kept before being put on the testing machine are one month, three months, twelve months, and two years, so that the work will necessarily extend over a considerable period. In addition to the above, a valuable and interesting collection of data is being obtained by the results of the analyses of a series of ancient mortars which have been forwarded to Mr. Dibdin by members of the Institute, amongst them being samples from the Roman wall under Leadenhall Market, from a Roman hypocaust at Chester, and from Allington Castle. As the special methods of investigation adopted by Mr. Dibdin set out certain features not shown in analyses previously published, the results of the investigation will be of special interest.

IN PARLIAMENT.

(From our Press Gallery Representative).

The Ventilation of the House.

The ventilation of the House of Commons was once again brought up last week by Sir Philip Magnus, who suggested that the windows of the Chamber should be thrown open, and that the House should adjourn for half an hour each evening.

Mr. Harcourt remarked that the opening of the windows would be a distinct hindrance to the efficient ventilation under the new and improved system. The absence of members might be an advantage at any period of the sitting, but even during their presence the whole of the air of the chamber was changed every five minutes, and it was possible, though not comfortable, to do this in three minutes. The more rapid change was invariably effected during divisions.

Sir Philip Magnus enquired whether it was a disadvantage that fresh air should be received through the windows rather than through the matting of the floor, over which members walked with their dirty boots.

Mr. Harcourt said the fresh air admitted by the windows was received only by the exhaust fan in the ceiling, and not by members on the floor.

Fire Precautions in Schools.

Mr. Wedgwood asked the President of the Board of Education a question as to the requirements regarding the design and structure of public elementary schools in connection with the possibility of fire.

Mr. McKenna said all plans submitted to the Board were carefully scrutinised with a view to securing adequate safeguards in case of fire. It was impossible to lay down detailed rules applicable to schools of all sizes and types, urban and rural alike. The general requirements of the Board were stated in the building regulations. The code laid down that the scholars of any school not situated wholly on the ground floor should be practised in fire drill.

Alleged Boycott of Irish Building Materials.

Mr. Field asked the Secretary to the Treasury whether he could explain the partial boycott of Irish materials by the Board of Works in Ireland with regard to the College of Science, the building in Tullamore, and other cases; and whether he could say why a copy of the specifications for buildings could not be furnished to a member of the House of Commons.

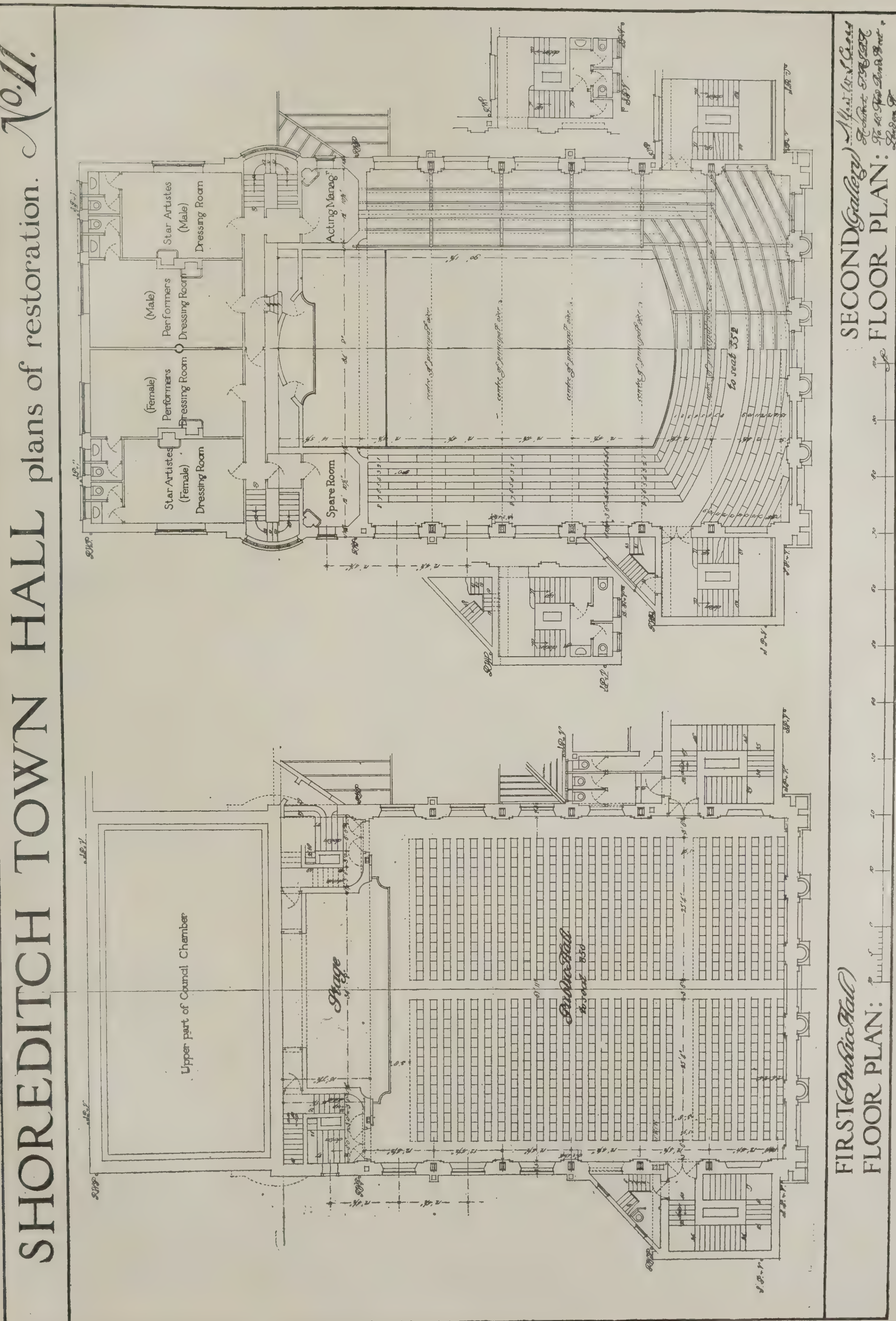
Mr. Runciman, in a printed reply, stated: "I am not sure what buildings the hon. member has in mind in his reference to Tullamore and other cases. If he refers, as I suppose, in the case of Tullamore to the contemplated new post office, I am informed that the specification for this building has not yet even been prepared. I can assure him, however, that no boycott of Irish materials by the Board of Works has taken place in connection with the College of Science or any other building works in their charge, as Irish materials are being employed wherever their use is compatible with efficiency, suitability, and economy. In the case of the College of Science about 86 per cent of the building material to be used is Irish. Specifications for buildings are only prepared with the object of enabling firms to tender for the works, and for the use of the contractors by whom the works are carried out. The only copy of the specification issued is that given to the contractor for the building, and it would not be in the interests of the successful carrying out of contracts that any other copies should be distributed."

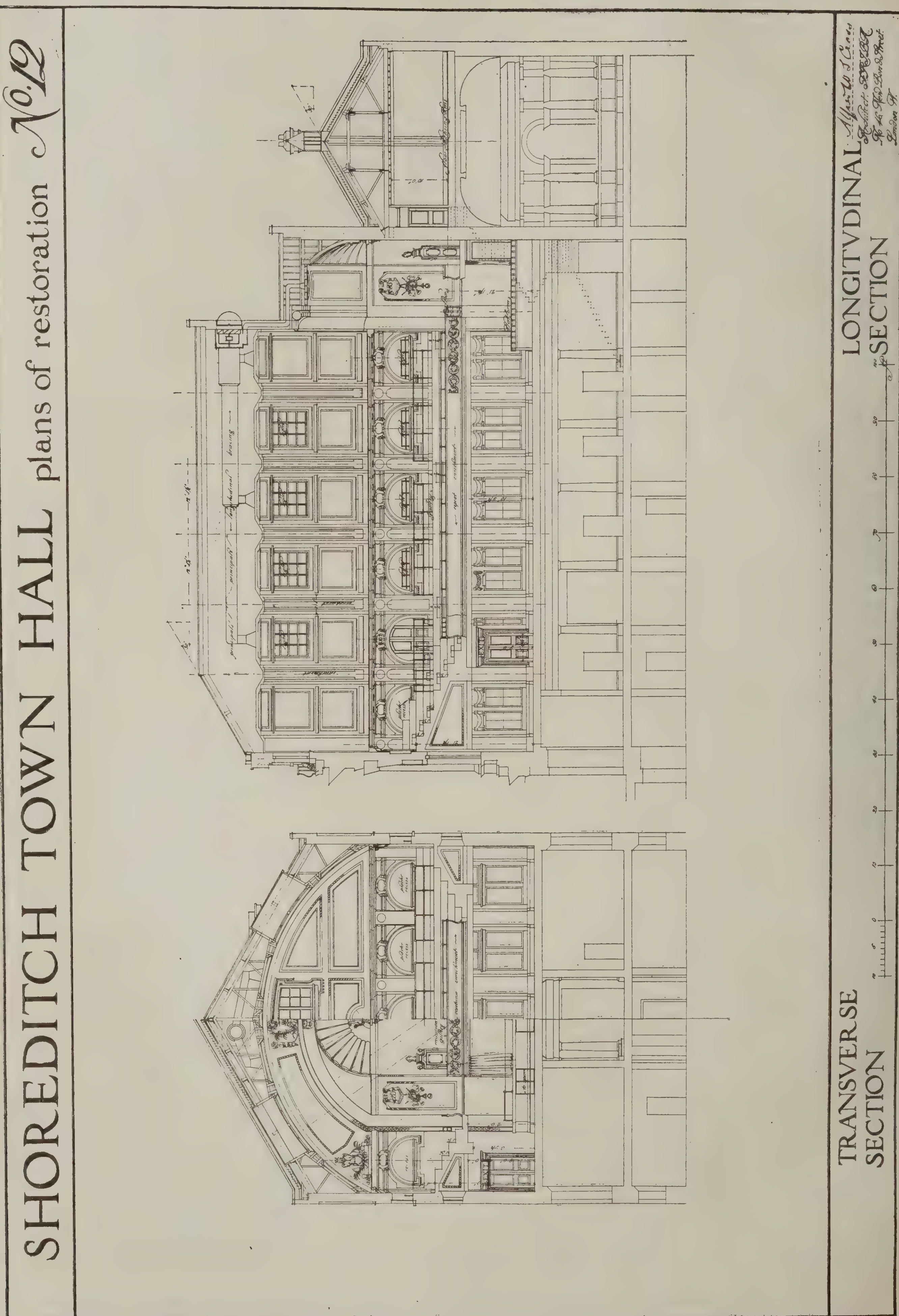
SHOREDITCH TOWN HALL.

The accompanying illustrations show the restoration of Shoreditch Town Hall after its partial destruction by fire in August 1904. The work was carried out at a cost of about £22,000, under the direction of Mr. A. W. S. Cross, M.A., F.R.I.B.A. The general contract was taken by Messrs. Killby and Gayford, of London, E.C., the constructional steelwork being supplied and fixed by Messrs. Homan and Rodgers. The sub-contractors were as follows: Marble work, Messrs. Fenning and Co.; patent glazing, Messrs. W. E. Rendle and Co.; fibrous plaster, Mr. Gilbert Seale; carving (wood and stone), Messrs. H. H. Martyn and Co.; decorative work, Messrs. F. de Jong and Co.; electric lighting, Messrs. Hemingway and Pratt; heating, Mr. J. Grundy; fire hydrants, Messrs. Z. D. Berry and Sons.

* * *

THE NEW KING'S COLLEGE HOSPITAL.—The work of demolishing three houses occupying part of the site at Denmark Hill required for the new King's College Hospital is well in hand. On its completion the erection of the first block, comprising casualty, bathing and electrical, out-patients' and dispensary departments, will be commenced. Messrs. Foster and Dicksee are the contractors. The buildings will cost £65,000, and are expected to be completed within eighteen months. Before the expiration of that time the administrative block will be commenced, after which the ward blocks will be taken in hand. In the first instance it is proposed to provide for about 350 beds, though the complete scheme makes provision for 600 beds and a medical school. Mr. William A. Pite, F.R.I.B.A., is the architect.


SHOREDITCH TOWN HALL plans of restoration. No. II.
Star Artistes (Male) Dressing Room
(Male) Performers Dressing Room
(Female) Performers Dressing Room
Star Artistes (Female) Dressing Room
Acting Manager
Spare Room
to seat 352
SECOND (Gallery) FLOOR PLAN:
Upper part of Council Chamber
Stage
Public Hall
FIRST (Public Hall) FLOOR PLAN:
ALFRED W. S. CROSS, M.A., F.R.I.B.A., ARCHITECT.



ALFRED W. S. CROSS, M.A., F.R.I.B.A., ARCHITECT.

THE VENTILATION AND HEATING OF THE WALDORF HOTEL.

The scientific ventilation of public buildings is now a subject of considerable importance, the general public having begun to appreciate the danger as well as the discomfort of an ill-ventilated room.

In modern buildings of the larger class the study of the heating and ventilation installation has become as necessary as the architectural design, though it is equally as necessary that the latter be interfered with as little as possible, the scheme running concurrently with that employed for the decoration of the building.

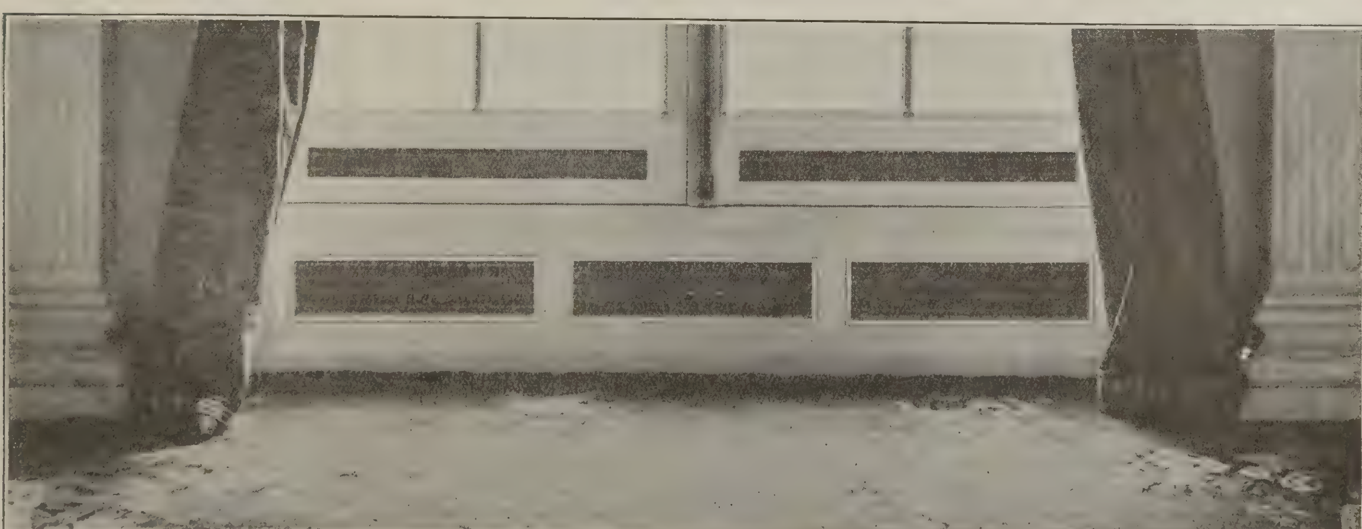
There is little doubt that mechanical ventilation, combined with a system for warming the incoming air in winter and cooling it in summer, if scientifically conceived and carefully carried out, is the best possible means that can be adopted, but although there are many firms carrying out work on this system—all, broadly speaking, on similar lines—the results achieved vary considerably in different buildings.

In many instances where mechanical ventilation has been condemned as a failure the fault lies not with the system itself, but is due either to the manner in which it has been executed or the incompetence of the man responsible for working the apparatus.

To ensure a thoroughly satisfactory result, it is necessary that the air should be purified before being distributed to the various rooms, and that means of controlling both the inlet and extract from each apartment be provided; and one of the most important points to be considered in devising a system of this kind is that the working should not be disorganised when the doors and windows are opened in any apartment.

Window in Ballroom, with Enclosed Radiator below.

View in Grill-Room Lounge, showing Air Inlet and Outlet Gratings.



Photos: "Architectural Review" Photographic Bureau.

Radiator under one of the Ballroom Windows.

THE VENTILATION AND HEATING OF THE WALDORF HOTEL, ALDWYCH, LONDON.

The foregoing observations may be read, opportunely, in conjunction with the accompanying particulars and illustrations of the ventilation and heating system of London's latest hotel—the Waldorf, on Aldwych, which system has been carried out by Messrs. Richard Crittall and Co., of 197, Wardour Street, Oxford Street, W.

The fresh air is taken down the intake ducts in the areas at the north-east and north-west corners of the grand lounge, and filtered by being passed through wet and dry screens. These screens are arranged so that the incoming air passes first through the wet screen, and secondly through the dry screen before entering the fans; thus the air, before being distributed to the various rooms, is thoroughly cleansed from all impurities.

The fans are double inlet cased fans, each direct-coupled to an electric motor.

In winter the fans drive the air through special mouth-pieces over heating batteries, and thence by way of the ducts through the gratings into the rooms, bye-passes being arranged under the batteries so that the temperature of the air can be regulated, while the volume remains the same; and it is also possible, by an arrangement of shutters, to regulate the temperature in any particular room.

WALDORF HOTEL: VIEW SHOWING COLD-WATER STORAGE TANKS ON ROOF.

The vitiated air from the grill-room, lounge, restaurant, ball-room, smoke-room, and masonic hall is carried away through openings into ducts leading to the vertical shaft carried up the area wall to the extract fan, which is a cased fan direct-coupled to an electric motor, and discharging through the roof. (The positions of the screen rooms and extract fan room would not permit of a photograph being taken.)

All the gratings in the various rooms are provided with regulating shutters for the purpose of adjusting the volume of air passing through. (The illustration on the preceding page shows those in the grill-room lounge.)

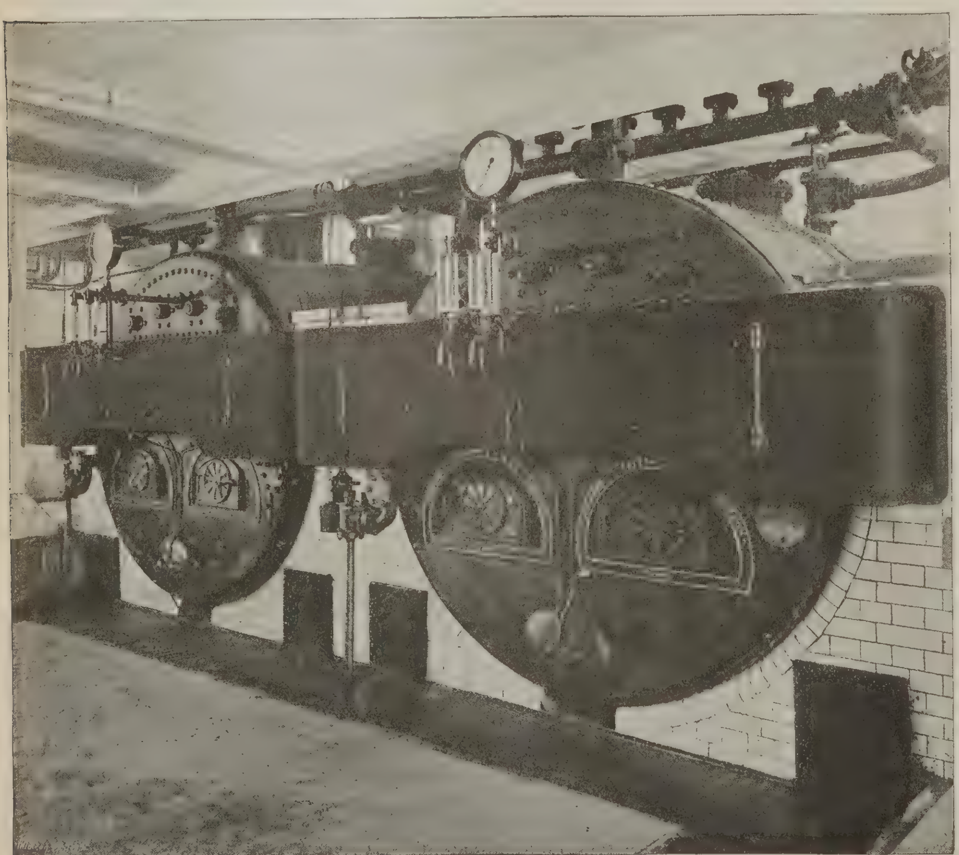
The kitchen, scullery, vegetable kitchen, still-room, and various other kitchen services are ventilated by a separate fan delivering into the air shaft formed around the kitchen chimney, all the rooms being connected up to the extract by means of metal ducts; a branch duct is also carried to the hood over the grill in the grill-room to carry off the fumes from same.

The air in the service-rooms named is changed nine times per hour:
in the Grand Lounge, 3 times per hour,
in the Grill Room 4 do.
and in the Grill Lounge 6 do.
the whole scheme being so arranged that there is an entire absence of draught or noise.

The other public rooms on the basement and ground floors, as well as the corridors, staircases, and entrance halls throughout the hotel, are heated by means of low-pressure steam radiators. The aggregate radiating surface of these is about 4,200 sq. ft. The steam is taken from the main steam pipe on the boilers, then reduced to the required pressure, and distributed to four horizontal steam mains carried under the basement ceilings, and connected to the radiators by means of vertical rising mains and branches. The photographs on the preceding page show the cased radiators along one side of the ball-room.

It may be mentioned that the cold-water supply is pumped up from the main intake tank in the basement by electrically-driven turbine pumps capable of dealing with 5,000 gallons per hour. We give a photograph of the large storage tanks on the roof, of 24,000 gallons capacity.

There are steam-heated calorifiers with automatic steam control, capable of supplying 4,000 gallons of boiling water per hour for baths and domestic purposes; and throughout the hotel everything has been carried out on a similar lavish scale, the whole scheme being a fine example of modern domestic engineering.



WALDORF HOTEL: STEAM BOILERS IN BOILER-HOUSE.

Church Vestries.—In the course of a paper on "The Arrangement of Churches and their Fittings" which he read before last week's meeting of the Manchester Society of Architects, the Rev. Percy Dearmer said that three vestries of good size were now generally required—one for the clergy, one for the churchwardens, and another with ample accommodation for a large choir: the last might with considerable advantage seat from 70 to 80 children for the afternoon Catechism service.

VILLA CAMBIASO, GENOA: DETAIL OF FACADE. GALEAZZO ALESSI, ARCHITECT.

March 25, 1908. Volume 27, No. 685.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

Notices.

Offices: Editorial and Advertisement—Caxton House, Westminster. Publishing—6, Great New Street, Fetter Lane, London, E.C.

Telegraphic Address: "Buildable, London."

Telephone: 364, Westminster.

Date of Publication: The Builders' Journal and Architectural Engineer is published every Wednesday, price 2d.

A Special Section is regularly presented free with the ordinary issue, three weeks out of every four. These three regular monthly supplements are entitled "Contractors' Section," "Concrete and Steel Section," and "Fire-resisting Construction Section" respectively.

The "Concrete and Steel Section" is given in this Issue.

The Subscription Rates per annum area follows:—

	s.	d.
At all newsagents and bookstalls	8	8
By post in the United Kingdom	10	10
By post to Canada	13	0
By post elsewhere abroad	17	4

All Accounts are payable to Technical Journals (1902), Ltd. Cheques should be crossed "London and Westminster Bank, Temple Bar Branch." Post Office Orders should be made payable at Fleet Street, E.C.

Contents.

Architecture at the Royal Academy.

The annual exhibition of the Royal Academy is now close at hand, the sending-in day for architectural works being Friday next, March 27th. This serves once more to remind us of the fact that the fatuous ban against photographs is not yet removed. It can hardly be imagined, however, that this exclusion of the best means of representing executed work will continue to be suffered for many more years. We are surprised, indeed, that the architect Academicians have not effected a reform long ago. If photographs were admitted into that small room of Architecture which is always a haven of refuge, a great attraction would be added to it, and a welcome relief would be afforded to the endless perspectives in colour which are so distressingly familiar.

Architects and their Fees.

The case of *Emden Egan and Co. v. The Wilkinson Sword Co.*, which was heard on March 12th and 13th, before Mr. Justice Lawrance and a special jury, is of much interest. The plaintiffs, a firm of architects, had designed buildings comprising a block of flats, a motor garage, restaurant, Turkish baths, gymnasium, etc., on a site in Chelsea. They alleged an agreement with the defendants by which they were employed to design these premises, and by which, in the event of the work being abandoned (as, in fact, it ultimately was), they were to receive a commission of 1½ per cent. on the estimated cost, which the plaintiffs put at £60,000. The principal matter in dispute was whether in fact this agreement was made (which question turned upon the accounts of a certain interview of March 6th, 1907, and an unsigned memorandum of the same date), and what was the correct estimate of the cost of the buildings. Neither question was answered specifically by the jury, who contented themselves with awarding the plaintiffs £800 out of the £900 claimed by them. In the event of the jury finding against them on the question of the making of the agreement, the plaintiffs alternately claimed upon the basis of a "*quantum meruit.*" This they reckoned according to the Institute scale of 2½ per cent., which would have had the effect of increasing their claim to £1,500, less 50 guineas for certain work not completed. But the Institute scale is not legally binding; and it has several times been judicially decided that it is unreasonable to attempt to impose the scale upon a contract which does not specifically incorporate it. (See the exhaustive judgment of Mr. Muir Mackenzie, Official Referee, in the case of *Horton v. Hemsley*, in the "Times" for February 19th last, and also the cases of *Burr v. Ridout* (1893), "Times," February 22nd, and *Farthing v. Tomkins* (1893), 9 T.L.R. 566.).

Memphis.

The appeal now being made on behalf of the great Egyptologist, Professor Flinders Petrie, for funds to enable the proposed excavations on the site of the ancient city of Memphis to be commenced and carried on without interruption is in every way worthy of support. Unfortunately, there is no public money available in our country for costly works of this nature, and while archæological associations of France and Germany are subsidised by their respective Governments, British workers in the same field are altogether dependent upon private support and personal generosity. Professor Petrie says that the work involved in clearing the site will occupy a very considerable time, and it is estimated that an annual expenditure of at least £3,000 will be required for the next fifteen years, even to excavate the ground formerly occupied by the immense temple. It is not altogether creditable to the nation that our Government persists in refusing financial support to a work of the greatest possible interest to all civilised countries, if only from the fact that France has expended about £50,000 in clearing the temples and buildings at Delphi, while Germany is said to have spent a similar amount in excavating Olympia and Pergamon. Memphis, the old-time metropolis of one of the most religious peoples in the world, possessed a magnificent temple, raised to Phthah, "the Revealer—the Divine Artificer by whom the world and mankind were created." This temple lay within the city and oritinually added to and enriched by succes-unpretentious building, which, being continualy added to and enriched by successive sovereigns, grew ultimately into a large and splendid structure. Herodotus saw it in its full glory and described it as "a vast edifice very worthy of commendation," and Abd-el-Latif, who saw it in its decline, speaks of the beauty of the remains of "the great monolithic shrine of breccia verde; nine cubits high, eight long, and seven broad—of the doors which swung on stone hinges—of the well carved statues, and of the lions, terrific in their aspects." A few fragments of the Colossus of Rameses now alone mark the site of the once stately temple of an ancient city —regarded by the ancient Egyptians as the oldest in their land and by modern Egyptologists as one of the early seats of civilisation. According to their historians the first King of whom the Egyptians had

any trustworthy records was M'na, called by the Greeks Mên or Menes, who originally held sway in Upper Egypt, but having mastered the lower country, and thus united the two provinces consisting of the long narrow valley of the Nile and the broad plains of the Delta, founded, in a position equally convenient to both parts of his kingdom, his new capital known as the city of Memphis. But before commencing to build his city, M'na is said to have undertaken and completed the gigantic task of raising an embankment against the natural course of the river, which thus forced from its bed, was made to enter a new channel and flow mid-way down the valley. To us it seems almost incredible that an engineering feat of this nature should have been carried out at the very dawn of history by a population that had only recently become a people. But precocity was the rule—not the exception—in ancient Egypt, and the pyramids themselves, which were constructed comparatively soon after the foundation of Memphis, emphasise the fact that the science of engineering was well understood and applied by the early Egyptians. Another marvellous example of their skill and workmanship is that huge architectural adornment, placed before the second pyramid and supposed to be contemporary with it, known to the Arabs as Abul-hôl (the Father of Terror) and measuring more than 100ft. in length—the great Sphinx. During a long career of prosperity—before her decline under the later Ramesides, and again after her restoration under Psamatik I., in some measure, to her former greatness and true national life, Egypt produced wonderful results in sculpture, pictorial art and literature. Under the reigns of Rameses II. and Menephthah, her chief literary men devoted themselves to the study of philosophy, divinity, history, and romance, and this was also the most brilliant period of Egyptian architecture, which reached its culmination in the pillared hall at Karnak—the most splendid single room that has ever been built: 330ft. long by 170ft. broad, it covered with its walls and pylons an area of 88,000ft.; its stone roof was supported by massive stone columns, divided into three groups—twelve central ones, each 66ft high and 33ft. in circumference, forming the main avenue, while, on either side, two groups of 61 columns, each 42ft. high and 27ft. round, supported the wings of the chamber. Fergusson says of it: "No language can convey an idea of its beauty, and no artist has yet been able to reproduce its form so as to convey to those who have not seen it, an idea of its grandeur." Although Egypt, by her early disappearance from among the nations of the earth, paid, as Mr. Rawlinson says, "the penalty of her extraordinarily precocious greatness," yet this country of mysteries will always hold the world's attention, and artists and art lovers will ever be attracted by its lofty obelisks, its enormous temples, its colossal statues and huge pyramidal masses. Any enterprise that seems likely to add to the knowledge we already possess of the arts, literature and science of a marvellous country and an equally marvellous people should meet with the sympathy of the public, and we confidently expect, therefore, that a prompt and liberal response to Professor Petrie's appeal will be forthcoming.

THE VILLA CAMBIASO, GENOA.

The Vienna Congress.

A circular letter has been sent out to all members of the Royal Institute of British Architects, and to those of the Society of Architects, and the Architectural Association, giving particulars of the arrangements which have been made in connection with the eighth International Congress of Architects, to be held in Vienna from May 18th to 24th next. The subjects for discussion include architectural copyright and the ownership of drawings, the position of the State in regard to the Fine Arts, international architectural competitions, the legal qualifications of architects, the preservation of public architectural monuments, and reinforced concrete buildings. Papers will be read on "The Influence of Modern Art in the Sphere of Architecture," "The Influence of Historic Styles of Architecture on the Development of New Styles," "A Comparison of the Building Laws of Berlin, London, Paris, Rome, and Vienna, in respect of their influence on Civic Architecture," "The Photometric Survey of Architectural Monuments," "The 'Copyright' of the Architect" and "Town Building in Germany in the Middle Ages, and its Importance for the Present." An exhibition will be held in connection with the Congress, and there will be numerous visits, receptions, and entertainments, official and otherwise. Special terms are being arranged with the railway companies and hotel proprietors. The probable cost of the return fare from London to Vienna will be about £8 15s. first-class, *via* Calais and Bâle, while for those wishing to travel together, the Royal Institute is arranging a personally conducted party, which will leave London on May 15th, arriving at Vienna on the 18th. The subscription to the Congress is fixed at 25 kronen (one guinea); ladies 15 kronen (12s. 6d.). Full particulars can be obtained from the Secretary of the R.I.B.A., at 9, Conduit Street, London, W. It is hoped that the list of British members will be as large as possible, bearing in mind how generous was the response of foreign colleagues at the Congress held in London in 1906.

The Shakespeare Memorial.

The controversy, now raging in a morning contemporary, concerning the proposed Shakespeare Memorial, makes interesting reading. We are particularly pleased with the views expressed by Mr. John Davidson, who asks: "Is Shakespeare dead that he must have a monument? . . . . Employ the money in purchasing and destroying existing statues. A statue of Shakespeare is impossible. No sculptor of genius would attempt it—Rodin, like his master Michael Angelo, can present Titans Titanically, but not Michael Angelo himself could begin to imagine a Shakespeare statue." The proposal to purchase and (in the interests of Art) to destroy existing statues is fundamentally sound. We believe the more prominent memorials erected to Shakespeare in his native country are to be seen in Leicester Square, the Poets' Corner in Westminster Abbey, and the British Museum in London, and at Stratford-on-Avon, and probably most of these could well be spared in so good a cause.

THE VILLA CAMBIASO, GENOA.

This, the first building of Galeazzo Alessi in Genoa, was built for Luca Giustiniano, having been commenced in 1548. It is now in the possession of the Marchese Cambiaso.

As with all the villas in the neighbourhood of Genoa, the plan differs from that of the town-palace, inasmuch as the rooms are not grouped around a courtyard, but form a compact building under one roof.

Externally the architecture, which has not here to be compressed into narrow streets of the city, shows a freer and robuster development. The disposition of the internal arrangement is emphasised by the treble partition of the facade; the ground floor is divided by a strong Order of Doric columns, the upper with fluted pilasters of the Roman Order, and the whole crowned with a rich cornice and light balustrade.

The building occupies an elevated and dominating site, and is approached along a wide drive, centrally disposed. The garden is of secondary interest, being, for the most part, laid out for use rather than for pleasure.

Like similar Genoese buildings, the facade is executed in stucco, which, however, was so excellently done that the building, after more than three hundred years, is still in excellent preservation. Only the columns and parapets of the upper loggia, and the balustrades are carried out in white marble. All the rooms are vaulted in brick, and many of them are richly decorated, the halls especially.

Gloucestershire Architectural Association.—At last week's meeting of this Association, Mr. A. W. Martyn (of Messrs. H. H. Martyn and Co., Ltd., of Cheltenham) read a paper on "Wood Carving," in which he reviewed the historical side of the art, dwelling at some length on the mediæval work of the 15th century and that of Grinling Gibbons of the 17th and 18th centuries. Mr. Martyn pointed out how religious enthusiasm accounted for the exceptionally fine carving of the mediæval periods, and of the early Renaissance work in Italy, and he deplored the want of some living factor in much of the work of the present time; he deplored also the decay of the apprenticeship system. It was, he said, the general lack of collaboration between artist and craftsman that helped largely to account for the want of spirit in a good deal of the modern wood-carving, and, for that reason, he appealed for a greater recognition of the craftsman.

VILLA CAMBIASO, GENOA: VIEW IN LOGGIA, FIRST FLOOR.

Correspondence.

The London County Hall Competition.

To the Editor of The Builders' Journal.

Sir,—In the current number of "The Architectural Review" there is an editorial note on the London County Hall competition which I take to be a sort of reply to your editorial of February 26th. Professional press criticism, unless favourable to the award, is discountenanced, and competitions of this kind are compared with sporting events, the spirit of which we are asked to take as our model.

This comparison, however, is unfair. In the college race referred to it does not require an umpire to announce that the boat which is five minutes ahead has won the race; nor will the losing crew be under any misapprehension.

We get a closer analogy when the umpire has to decide a point where there is room for two opinions, and in such cases, while accepting the decision, sportsmen are apt to be very human.

But there is more than this to justify the expression of architectural opinion. Competitions cost a deal of money, and those who enter them combine business with their sporting feelings. It is a natural inference that the best scheme should win, and if a large professional body considers that a proper award has not been made, it is surely quite reasonable, and even proper, that such a view should find expression.

Public opinion is supposed to have a salutory effect on the administration of the law. Why should we be deprived of the same influence on assessors' judgments?—Yours truly,

William Haywood.

Birmingham.

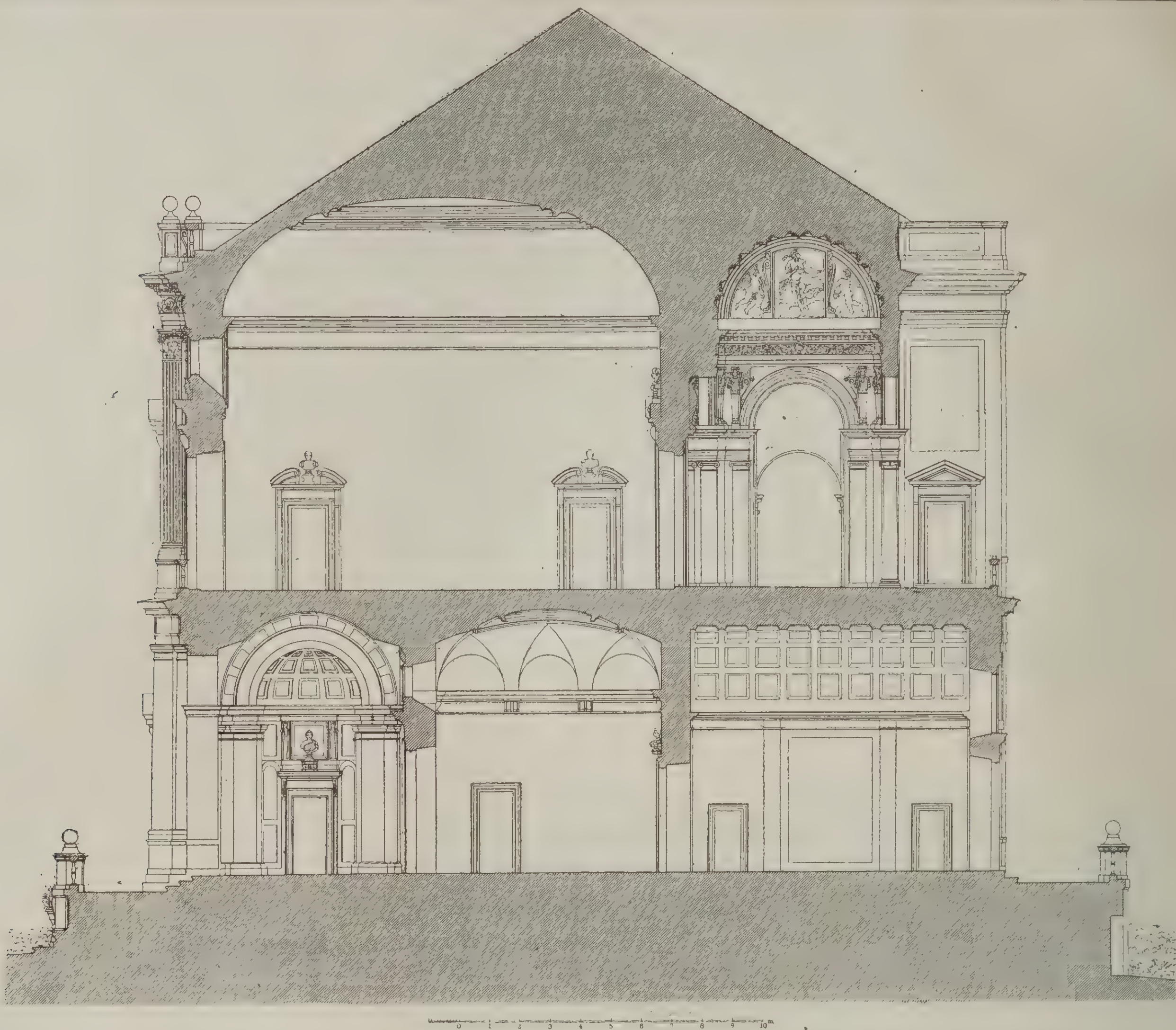
To the Editor of The Builders' Journal.

Sir,—The opening of your columns to criticisms of the accepted design for the London County Hall must have been appreciated by many in the profession, the more so since it has become known that the proposed discussion on the designs at the Institute has, for some mysterious reason, been deleted from the note of prospective arrangements.

A first glance at the accepted plan leaves an impression of simplicity and compactness, and that the required accommodation is provided in a much smaller building than in any of the other designs, but a careful study of the details soon reveals the fact that this has only been made possible by the author adopting certain lines to which no architect with experience in this class of building would have given a moment's serious consideration, particularly in view of the statement in the conditions that good lighting in every part is essential.

Now, we find in Mr. Knott's plan that the heights of the ceilings, in place of being, say, 20ft. for the main floor and 14ft. to 12ft. for all other floors, range from about 13ft. 6ins. for the main floor to 10ft. and 9ft.—and that for rooms 25ft. or 26ft. deep, already too deep, even with higher ceilings than are shown; while the area of window space provided to light these deep, low, apartments is in some floors as low as 9 per cent. of the floorage area, instead of 20 per cent., which is desirable in a modern office block.

The adoption of low ceilings has allowed the provision of two extra floors within a building of even less cubic contents than in any other design, and this, together with the placing of rooms on each



side of a corridor, and building even to beyond the face of the embankment wall, has made a simple and compact plan possible; but at what cost.

It has already been stated that the plans are to be modified as indicated by the assessors, and if the alterations are such as to meet the above objections, it is scarcely necessary to remark on the elevations, as it is at once apparent that with a design in the "Scotland Yard-Gaiety Theatre" style of architecture, which depends so much on the proper proportion of solids to voids, the alterations in the height of ceilings, to note only one point, would of necessity entail the conception of the facades on totally different lines to those adopted.

Yours truly,

"CORRIGENDA."

A Consulting Architect and Competition Specialist.

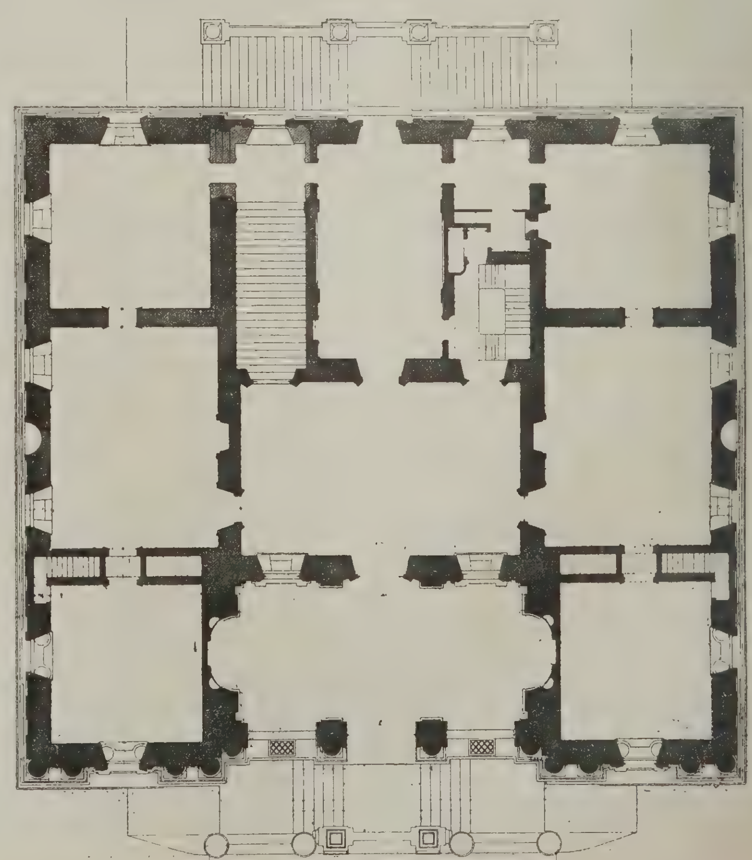
To the Editor of THE BUILDERS' JOURNAL.

SIR,—I have read with interest the leaderette in your issue for March 18th on the circular issued by a person styling himself "A Consulting Architect." Those who have occasion to seek the assistance of a consultant will be well advised in not replying to letters from a so-called Consulting Architect who resides in a small island at the southern extremity of England.

Yours truly,

THE EDITOR OF "THE ARCHITECTS' AND SURVEYORS' DIRECTORY."

London, E.C.



VILLA CAMBIASO, GENOA: CROSS-SECTION AND GROUND-FLOOR PLAN.

THE ARCHITECTURAL ASSOCIATION.

Mr. Henry Tanner, junr., on the Domestic Work of the English Renaissance.

A meeting of the Architectural Association was held on Friday evening last at 18, Tufton Street, Westminster. In the absence of the president, Mr. Walter Cave (who was laid up with influenza), the chair was occupied by Mr. A. Needham Wilson.

The following new members were elected:—Messrs. P. M. Davies, G. M. Eaton, J. O. B. Hitch, J. A. Meikle, J. J. Joass, and O. J. G. Seddon.

It was announced that the annual dinner of the Association would be held on April 9th at the Gaiety Restaurant.

The House List

for the next session was read as follows:—

President—
Mr. Walter Cave, F.R.I.B.A.*

Vice-Presidents—
Mr. Henry Tanner, Junr., F.R.I.B.A.*, and Sir A. Brumwell Thomas, F.R.I.B.A.*

Ordinary Members of Council—
Mr. Louis Ambler, F.R.I.B.A.*
Mr. F. Dare Clapham, A.R.I.B.A.*
Mr. W. Curtis Green, A.R.I.B.A.*
Mr. Baxter Greig, A.R.I.B.A.*
Mr. Herbert A. Hall, A.R.I.B.A.*
Mr. Stanley H. Hamp, A.R.I.B.A.
Mr. Arthur Keen, F.R.I.B.A.*
Mr. Percy W. Lovell, A.R.I.B.A.
Mr. H. I. Merriman.
Mr. F. Winton Newman, A.R.I.B.A.
Mr. M. G. Pechell.
Mr. G. Gilbert Scott.
Mr. J. H. Squire.
Mr. A. H. Ryan-Tenison, F.R.I.B.A.
Mr. Stanley Towse, A.R.I.B.A.
Mr. Septimus Warwick, A.R.I.B.A.
Mr. A. Needham Wilson, A.R.I.B.A.*
Mr. E.W.M. Wonnacott, A.R.I.B.A.*

Hon. Treasurer—
Mr. Henry T. Hare, F.R.I.B.A.*

Hon. Librarian—
Mr. Percy May.

Editor of the A. A. Journal—
Mr. Edwin Gunn, A.R.I.B.A.

Hon. Secretaries—
Mr. C. Wontner Smith, A.R.I.B.A.,* and Mr. Maurice E. Webb.*

* Members of present Council.

Mr. Henry Tanner, jr., F.R.I.B.A., read a paper entitled "Some Notes on English Domestic Work of the Renaissance."

For the sake of convenience he divided the Renaissance work of this country into four general periods, namely: (1) The period from the time of Henry VIII. to Inigo Jones; (2) the time of Inigo Jones and his school; (3) that of Sir Christopher Wren and his school; (4) that of the XVIIIth century architects.

The First Period.

The first period of the Renaissance in England (if we may call it so, although it is not so properly speaking) began with the introduction of Renaissance forms and detail by foreign imported workmen; firstly, Italian in Henry VIII.'s reign, and, later German; the former period of work was not lasting, but merely superficial and grafted on to the Gothic forms, though the English builders later, having assimilated a certain amount of the style from these foreign workmen and pattern books, did produce work of very great charm—flavoured, not spotted, with classic form.

The most complete piece of work of the Italian period is the screen and stalls in the chapel at King's College, Cambridge—magnificent woodwork, though it is doubtful whether we are entitled to consider it as anything but a complete piece of imported Italian work.

The German Influence.

The later, German, influence is easily discernible in a considerable number of large houses built in Elizabeth's reign, as at Burghley House, near Stamford, and at Hatfield, and also in a large number of small brick buildings all over our east and south coasts. Their work seems to have consisted mostly of tricks of the trade, certain samples of goods variously arranged; among the favourite specimens being coarse figures as supports, with the lower half merging into pilasters, heavy strapwork and rusticated wooden columns, and bulging shelves or friezes.

The True English Work.

The English master builders, masons, and carpenters who were carrying on work during the period just described, and continued to do so for some time after Inigo Jones, and who were further removed from the centres of foreign influence and only slightly affected by it, were responsible for some of the most charming and picturesque work in the country, especially as they refrained, generally speaking, from an excessive use of ornament. Their work was not brilliant in design, but full of common sense and free from striving after effect; the public demand was not yet for a skilled designer, and they were content with the comfortable traditional work handed down from father to son, and very adaptable to their needs.

Inigo Jones.

The real Renaissance in England came about through the instrumentality of one man, Inigo Jones. The English house plan was changed entirely at his hands, and the design of the work in the country under his guidance was no longer scraps of classic ornament and detail grafted on to English work, but the real English Renaissance.

It was after Inigo Jones's second visit to Italy that he started working seriously at architecture; before, most of his time had been occupied with masques and as surveyor to Prince Henry. Among his earlier work was the Queen's House, Greenwich (about 1619), the noticeable feature of which is the loggia on the first floor. In the same year the banqueting house in Whitehall was destroyed by fire, and he was commissioned to design a new one. He produced a fine plan for a new palace, the first block of which was soon started, but unfortunately this familiar building was the only part of his magnificent design ever executed.

Inigo Jones carried out a goodly amount of domestic work in the neighbourhood of Lincoln's Inn Fields; Linsay House and the houses in Great Queen Street being very similar in treatment, the latter being a very interesting example of brickwork of the period. Pendhill, in Surrey, is another interesting design in brick, built in 1636, very simple in treatment, the only ornament being the panelling on the walls and chimney stacks, and the brick rustication to the porch. Raynham Hall, in Norfolk, is a very striking design, the most interesting part being the very original treatment of the gables with the volutes and the pediment at the top, the idea evidently being to do something unconventional and not too rigid for a domestic building of brick and stone, such as an orthodox pediment, the full width of the projecting wing. Swately Hall, Uxbridge, erected about this time, also shows a very similar treatment.

Wilton House, which Inigo Jones rebuilt for the first Earl of Pembroke, contains some of his best work; the south front is his design as he left it, and is as well known for its beauty as the famous double cube room, which is in the centre of this facade.

The most perfect remaining work of Inigo Jones, however, is Coleshill, in Berkshire, which shows good proportion and good detail throughout, and has a magnificent staircase—a survival of earlier times—leading up to the dining-room on the first floor; while another grand staircase by this architect is at Forde Abbey, Dorset.

Inigo Jones died in London in 1652, at the age of seventy-nine, in evil days for architecture, as very little work was done during the Commonwealth.

His Followers.

Of Jones's followers we know but little; he had, however, one distinguished pupil in John Webb, whose work closely resembled that of his master. Webb built Ashdown House, not very far from Coleshill, and executed some work at the Vyne, Basingstoke, but his best domestic work was Thorpe Hall, near Peterborough, a good and simple design, based on the same lines as Coleshill.

The names of Gerbier, Marsh and Wynne are the only others that come down to us from the time of the Commonwealth, and the period linking up Inigo Jones and Wren, and the amount of work they did was inconsiderable.

The Later Renaissance,

which arrived at maturity during the next period we have to discuss, may be distinguished from the earlier, briefly, by saying that the works of the one were schemed as a whole; the others, in parts; the buildings of the one were completely designed before their commencement, conceived with a due regard to a general proportion and a proper relation of parts, with a view to symmetry and stateliness, and even, perhaps, severity; the buildings of the other seem to have grown, the initial plans being very slight, and each portion designed as it was reached.

The great figure of this period was

Wren,

who was born in 1632. Mr. Tanner gave a summary of his works, mentioning, in connection with Hampton Court Palace, that here the interior decoration and detail showed the work of the best school of craftsmen (Grinling Gibbons, Cibber, Tijou) that ever existed in this country.

Of Wren's successors, the most prominent was Hawksmoor, who was associated with him at Greenwich; Vanbrugh, who carried the grand manner in architecture to such an extreme that finally size alone seemed to be his object in design; and Gibbs.

During the XVIIIth century and after the disappearance of Wren's school, of whom Gibbs was the last, there were two groups of architects at work in England—the amateurs, such as Lord Burlington, Cambell, Dean Aldridge, and Kent, and their supporters: and, on the other hand, architects like the Woods of Bath and Carr of York.

Spencer House, by Vardy, and the houses on the north side of Cavendish Square are works of this period, and without going further to the time of the brothers Adam and Sir William Chambers, we may quite well leave it, as tracing the style up to the zenith is so full of interest that the study of the decline is comparatively uninteresting, though, of course, much good work was still executed.

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible. The querist's name and address must always be given, not necessarily for publication.

Builder's Position in Regard to Completion of Work.

FRANCIS writes: (1) Does the entering upon an uncompleted building and the using of it, wholly or in part, by the owner, without the builder's consent, relieve the builder from the onus of finishing the work? (2) If it does, must the builder be paid for the building as if he had actually completed the work? (3) Would it make any difference if the contract were for a lump sum, if with quantities part of the contract or not part of the contract?"

(1) The entering upon a new building does not necessarily relieve the builder of any kind of responsibility for the work, although, of course, it may form the subject of a claim by him that the completion of the building has been hampered and retarded by the occupation. (2) No; he must carry out his contract. (3) No. X.

Floor Pugging.

LONDON.—S.D.T. writes: "A wood floor, to be made sound-resisting, is specified to be pugged with concrete (4 of breeze to 1 of cement) 3 ins. thick, upon ½-in. boarding, between the joists. Is this as effective as chopped hay and plaster, and is there not a danger of the wet concrete setting up dry rot in the joists?"

Pugging with concrete on ½-in. boards, between floor joists, is not effective in preventing the passage of sound, concrete being a good conductor. Chopped hay is better, and silicate cotton, or slag wool, better still. It is best laid loose, not pressed in tightly. It is quite possible that as some time elapses before the moisture in concrete is entirely parted with, dry rot might ensue. T.P.

South Kensington Examination in Building Construction.

LONDON.—X writes: "I shall be glad to know in what issues you published answers to questions set in building construction at the South Kensington examinations during the past three years."

Answers to the questions set in 1904 appeared in the following issues: Stage 1, May 18th; Stage 2, 3, and Honours, June 8th. We did not publish any answers for 1905. In 1906 Stage 1 was dealt with in our issue for May 23rd, Stage 2 in the issue for June 6th, and Stage 3 in the issue for June 27th.

Schedule of Dilapidations.

LONDON.—VIATOR writes: "I am much obliged to you for the reply to my enquiry on p. 225 of your issue for March 11th. I can hardly agree, however, with the third part of X's reply.—(1) Are not all covenants to repair to the first lessee personally? (2) Does not he in turn pass them on to his assignees? (3) If the first lessee can be found, and he is a sound man, should not action be taken against him, and then let him, if he will, take action against the assignees of the lease?"

After further consideration of the points raised, I see no reason to alter my opinion. My profession, however, is that of a land agent and surveyor; I am not a solicitor. In reply to the further issues now raised, I am of opinion (1) That the covenants by the first lessee are never of personal character, but are such as "run with the land." (2) Yes, he passes them on to his assignees, who take his place in the responsibility for repair, etc., attaching to the property. (3) I think not; one must remember that if the original lease contained a clause prohibiting assignment without the lessor's consent, that consent must have been obtained at the time of the assignment; and that if the lease contained no such clause, the lessee had full right to transfer both his rights and his liabilities under the tenancy. X.

Removing Rainwater Tank and Lavatory Basin.

NERO writes: "A tenant has a rainwater tank standing on two brick piers, and the landlord has brought down his pipe into same. The tenant is leaving. Has he the right to remove the tank before giving up possession? Also, can he remove a lavatory basin, fixed at his own expense, though the landlord has brought down the water service pipe and connected to it?"

In the absence of any special agreement to the contrary, the tenant has the right to remove both the tank and the lavatory basin at any time during the continuance of his tenancy. He should, however, first offer them to the landlord, thus giving him the option of taking F.J.I.

Secondary Schools.

X writes: "I shall be glad to have some information in regard to regulations for secondary schools; also some reference to recent designs for such schools."

From the leader in our issue for January 15th, you will see that new regulations for secondary schools have recently been issued by the Board of Education. A copy can be obtained from Messrs. Wyman and Sons, Ltd., 109, Fetter Lane, E.C., price 2d. With regard to recent designs, on page 75 of our issue for January 22nd last you will find a list of secondary schools which have been illustrated in our pages during the past year.

Book on Mosaic Work and Concrete.

BOLTON.—F.G. writes: "Can you tell me of a good book on concreting and mosiac laying?"

There is no book published dealing exclusively with mosaic tile laying. Appendix B in Furnival's "Leadless Decorative Styles," published by Batsford, 94, High Holborn, has some pages devoted to the subject, but it is an expensive work. Potter's "Concrete," the third edition of which will be published by Mr. Batsford in April or May, contains notes on the subject, and on concrete generally. T.P.

DISSOLUTION OF PARTNERSHIP.—Mr. Harvey's state of health requiring a long period of rest and change, the partnership hitherto subsisting between Mr. Rowland Plumbe, F.R.I.B.A., and Mr. Frank M. Harvey, F.R.I.B.A., practising as architects and surveyors, has been dissolved by mutual consent, as from March 9th. The practice will be continued at 13, Fitzroy Square, London, W., by Mr. Rowland Plumbe, to whom all communications should be addressed.

COMPETITION FOR FARM BUILDINGS

The following is a summary of the conditions of the competition for farm buildings instituted by the Royal Agricultural Society of England:—

The plans must provide for the accommodation suitable for a mixed farm of not less than 300 acres and not more than 400 acres in extent. The farm is assumed to be half grass and half arable.

The dwelling-house and buildings must be suitable for a tenant farmer.

No site plan will be issued by the Society.

Plans, elevations and sections of the various buildings must be drawn to a scale of 8 ft. to 1 in. Block plan to a scale of not less than 40 ft. to 1 in. (A plan only of the dwelling-house is required, and no elevations or sections thereof need be submitted.)

First prize, £50 (or the Society's gold medal); second prize, £25; third prize, £15; fourth prize, £10.

Judges: Mr. Arthur S. Gibson, Nottingham; Mr. Charles P. Hall, Woburn, Beds. (President of the Land Agents' Society); Mr. Frederick Reynard, Driffield, Yorks.

A specification and short descriptive statement must be sent with each set of drawings, and also an estimate, with particulars stating the basis on which such estimate has been calculated.

No competitor must send in more than two sheets of general drawings, and a bird's eye view showing the disposition of the buildings.

The points to which the attention of the judges will be specially directed are:—(1) Economy in planning, and in cost of construction and subsequent maintenance; (2) Convenience of arrangement for working, and accommodation for animals; (3) Lighting, ventilation and drainage of the sheds, especially those for dairy cattle.

The Royal Agricultural Society reserves the right of publication of any or all of the plans to which prizes may be awarded, and of exhibiting at the Newcastle Show such plans as may be considered of sufficient merit. The plans of unsuccessful competitors will be returned to them after the close of the Show in July, but the Society can accept no responsibility for the plans whilst in its possession.

Plans must be sent to the Society's House, 16, Bedford Square, London, W.C., on or before Friday, May 1st, next, together with specification and report, and must be accompanied by the entry form and entry fee of £1.

Full particulars can be obtained from the secretary, Mr. Thomas McRow, 16, Bedford Square, London, W.C.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
April 24	DOOR AND WINDOW FITTINGS.—(Assessors, Mr. Henry T. Hare, F.R.I.B.A., and Mr. Leonard Stokes, F.R.I.B.A.). Premiums of 15, 5 and 3 guineas. Particulars from N. F. Ramsay & Co., 1, Victoria Street, Westminster.
May 1	FARM BUILDINGS.—Premiums £50, £25, £15 and £10. Particulars from Thomas McRow, Secretary, R.A.S.E., 16, Bedford Square, W.C.
May 15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
July 31	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date: final competition to be limited to six competitors, by whom designs are to be submitted not later than February 28th, 1909.
No date.	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to Architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall, Eccles, Lancs.

CONCRETE AND STEEL SECTION.

(MONTHLY).

SOME REFLECTIONS ON THE QUEBEC BRIDGE DISASTER.

The report of the Royal Commission appointed to enquire into the causes of the Quebec bridge disaster has now been delivered to the Canadian House of Commons, and the summaries which have been cabled over show that the three Commissioners, Mr. Henry Holgate, Mr. J. C. Kerry and Professor Galbraith, have come to conclusions similar to those which were arrived at by the majority of engineers, and by ourselves, as soon as the general facts concerning the collapse had been disclosed.

Briefly, the collapse is attributable to the failure of the lower compression chord members in the anchor arm, near the main pier, due to their defective design. Both Mr. Theodore Cooper, the consulting engineer of the Quebec Bridge Co., and Mr. Szlapka, the designing engineer of the Phœnix Bridge Co., are blamed for this by the Commission. Not only had Mr. Cooper's specifications allowed far too high a unit stress, but Mr. Szlapka underestimated the dead load. Attention is called to the insufficiency of the data upon which dependence was placed in the design of the structure, and it is obvious that a much greater factor of safety should have been provided for, or else that further experimental investigations should have been made beforehand, so as to obtain reliable data for the design.

We feel that this report reflects upon the outlook of American engineers, as a body, in such matters. It is true that Mr. Cooper went a little further than his confrères, but it seems evident, from the American text-books, and the contributions to the American engineering journals, that, for many years past, engineers have been risking too much, and have neither appreciated the insufficiency of the experimental research upon which their theory and methods of design were based nor the importance of their tasks. American engineers seem to have designed large structures in far too light-hearted a manner, and perhaps this lesson will do them much good.

We have nothing upon which to compliment ourselves, because we are as ignorant in theory as are the American engineers; indeed, we are to blame for doing even less research work than is done in the United States: it is one of the most reprehensible features of the architectural and engineering professions that we do not go in for more experimental study in this country. We do think, however, that the majority of English engineers appreciate the importance of their calling more than American engineers do, and, consequently, do not take such risks. For this reason our designs are often not so economical in first cost, it is true, but they are safer, and on a work of any magnitude the engineers responsible exercise the utmost care, and run no risks.

At Quebec just now there is much discussion going on with regard to the proposal to resume the building of the bridge on plans only slightly altered from those which were being followed at the time of the disaster in August last. Mr. Szlapka, the engineer to the Phœnix Bridge Co., who have the contract in hand, replies to the criticisms of the Commission by saying that the decision does not rest with his company, but that they are obliged by the Government to carry out the plan already decided upon. Mr. Szlapka declares that Mr. Cooper, the Government expert, was warned of the apparent weakness of the great span of 1,800ft., but that he refused to modify the plans in any way. It is being urged that the new arrangements for strengthening the span are inadequate.

The following is a summary of the report of the Commission on the Quebec bridge disaster :—

The Defective Chords.

The Commissioners find that the collapse of the bridge resulted from the failure of the lower chords in the anchor arm near the main pier, and that the failure of these chords was due to their defective design. The stresses that caused the failure were not due to abnormal weather conditions or accident, but were such as might be expected in the regular course of erection.

The design of the chords that failed was made by Mr. P. L. Szlapka, designing engineer of the Phœnix Bridge Co., and this design was examined and officially approved by Mr. Theodore Cooper, consulting engineer of the Quebec Bridge Co. The failure cannot be attributed directly to any cause other than errors in judgment on the part of these two engineers. These errors, however, cannot be attributed either to a lack of common professional knowledge, neglect of duty, or a desire to economise. The ability of the two engineers was tried in one of the most difficult problems of the day, and proved insufficient for the task.

Errors in Calculation.

The Commissioners do not consider that the specifications for the work were satisfactory or sufficient, the unit of stresses in particular being higher than any established by past practice. The specifications were accepted without protest by all interested. A grave error was made in assuming the dead load for calculations at too low a value and not afterwards revising the assumption. This error was of sufficient magnitude to have required the condemnation of the bridge even if the details of the lower chords had been of sufficient strength, because if the bridge had been completed as designed; the actual stresses would have been considerably greater than those permitted by the specifications. This erroneous assumption was made by Mr. Szlapka and accepted by Mr. Cooper and tended to hasten the disaster.

The Question as to whether the Collapse could have been Prevented.

With regard to the point raised that the bridge was known to be unsafe before the collapse occurred, the Commissioners do not believe that the fall of the bridge could have been prevented by any action taken after August 27th last. Any efforts to brace or take down the structure would have been impracticable, owing to the manifest risk to human life involved. The loss of life on August 29th might have been prevented by the exercise of better judgment by those in charge of the work for the Quebec Bridge Co. and for the Phœnix Bridge Co. The failure on the part of the Quebec Bridge Co. to appoint an experienced bridge engineer as chief of the works was a mistake. This resulted in loose and inefficient supervision of all parts of the work by the Quebec Bridge Co. The work done by the Phœnix Bridge Co. in making the detail drawings and in planning and carrying out the erection, and by the Phœnix Iron Co. in fabricating the material, was good, and the steel used was of good quality.

Insufficiency of present-day Knowledge of Steel Columns under Load.

The serious defects were the fundamental errors in design. No one connected with the general designing fully appreciated the magnitude of the work or the insufficiency of the data upon which they depended. Special experimental studies and investigations were required to confirm the judgment of the designers, and were not made.

The professional knowledge of the present day concerning the action of steel columns under load is not sufficient to enable engineers to design economically such structures as the Quebec Bridge. A bridge of the adopted span which would unquestionably be safe can be built, but in the present state of professional knowledge a considerably larger amount of metal would have to be used than might be required if our knowledge were more exact.

In conclusion, the Commissioners state that the professional record of Mr. Cooper is such that his selection for the authoritative position he occupied was warranted, and the complete confidence placed in his judgment by the officials of the Dominion Government, the Quebec Bridge Co., and the Phœnix Bridge Co. was deserved.

Professor Claxton Fidler and the Question of Equilibrium.

In the course of a letter to the "Times," Professor T. Claxton Fidler, of the University of St. Andrews, says: "It is probable that the collapse of the Quebec Bridge will never be explained by the most complete and the most scientific calculations of stress and strength, if the word 'strength' is to be understood in its usual sense. But on the other hand I would venture to submit that an adequate explanation may be found in a totally different direction ; for the question whether a bridge will stand or will fall is not merely a question of strength (in this sense of the word), but is also a question of stable equilibrium. . . . The American system of competitive design demands by its rules the most ample guarantees for strength, but none for stability.

"The idea that a bridge will always be safe when every member is made strong enough for its greatest calculated stress is, therefore, a fallacy, whose danger is once again illustrated, as it has been in so many bridge failures of past times. . . ."

INSERTING NEW GIRDERS UNDER FRONT.

By Alan E. Fletcher, M.S.E.

When for any reason it becomes necessary to supplement the girders carrying an existing building, or to replace them by others, the method of carrying out the alteration becomes a consideration second only in importance to the design of the steelwork. Much caution and judgment are needed, and it is especially in these cases that previous practice and experience are valuable. For this reason it is hoped that the following notes of a job recently carried out may be of service, since, while presenting one or two features of peculiar interest, the general nature of the work is not uncommon.

The building, of which a sketch plan is given in Fig. 1, was four storeys in height and of the dimensions shown. It was carried on the ground floor by piers at intervals, with compound girders between the piers, but these latter were too light when originally put in to carry the load, and the building was in an unsafe condition. It was proposed to put in stronger girders, supported at intervals on columns, and to construct an open (glass) front on two sides.

The first difficulty lay in the fact that owing to limited space on the pavement outside, the great weight of the building, and that failure was already threatening, it was necessary to shore very thoroughly, and an open shoring (as Fig. 2), which would have permitted a clear lift for the new girders, was considered to be inadvisable. Shoring of the form shown in Fig. 3 was decided upon, and as it was considered too risky to lift and pass the girders endwise along the top bay of the shoring—they being of very heavy section and the longest being about 35 ft. in length—some other way had to be devised.

The wall was first cut through to pass the cross timbers of the bottom bay of the shoring with the bracing timbers, as shown in Fig. 3. The girders were then hoisted on to rollers on the top of the cross timber and carefully pinched over close to the wall. The shoring was kept about 9ins. out of centre with the wall to allow the girders to lie in the position shown, and also for a reason presently to be mentioned.

The shoring was then completed as shown in Fig. 3, and needles of 10 in. by 5 in. rolled steel joists were put in, each having two ¾ in. holes in the flanges on opposite sides; they were secured by bolts to the old girders, the holes in the latter being drilled by hand. These joist needles rested on folding oak wedges, which were examined frequently to see that they were tight and that each needle was taking its share of the weight. The wedges rested on the transomes of the shoring; the latter was of 12 in. by 12 in. baulk timber, which, being wet when put up, was kept watered on one or two exceptionally hot days where the sun got to it, to prevent shrinkage as far as possible.

The whole of the wall was then removed and the girders raised by chain blocks by means of a temporary staging, as shown in Fig. 4, to within a few inches of the needles. Timbers of stout scantling were then laid underneath them, supported on packing, and upon these were placed some pieces of old flat bar and pipe

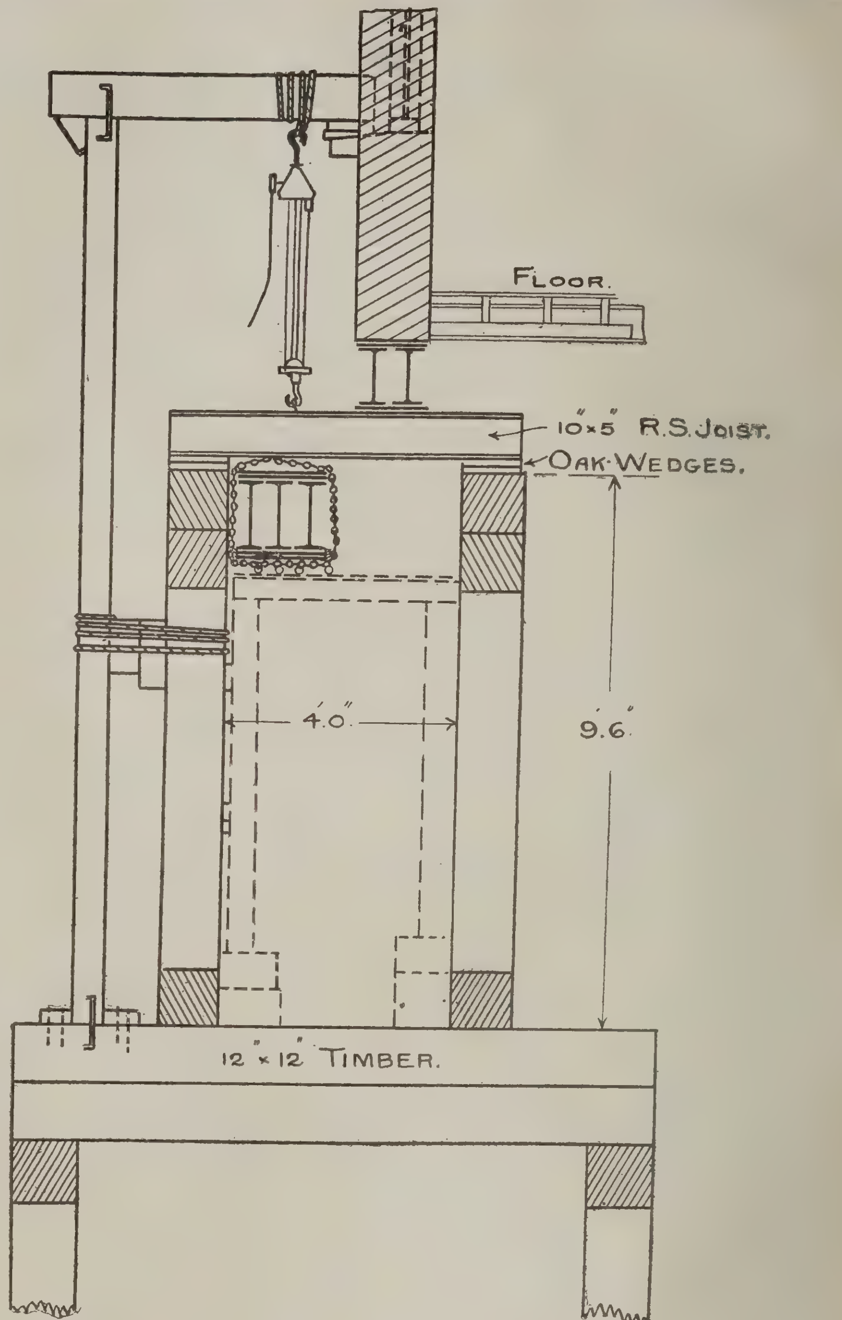


FIG. 4. TOP BAY OF SHORING STAGE, SHOWING GIRDER LIFTED AND READY TO DROP ON ROLLERS.

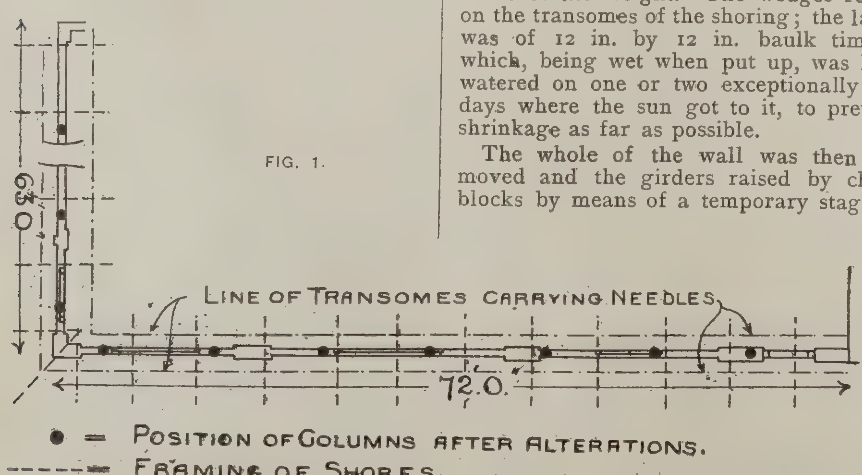


FIG. 1.

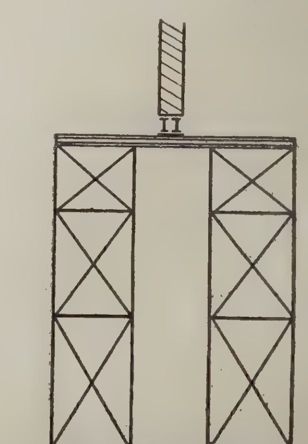


FIG. 2. OPEN SHORING.

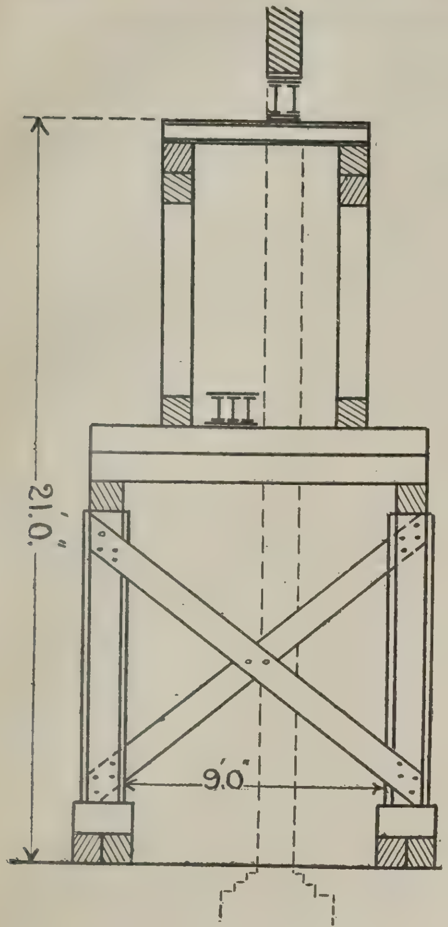


FIG. 3 SHORING WITH NEW GIRDERS LAID ON TOP BAY.

rollers, the bar preventing the rollers sinking into the wood (Fig. 5). The girders were lowered on to the rollers, but small pieces of 1 in. bar were put between the rivets so as to clear them from the rollers. The girders were then pinched over on the rollers to a position exactly central with the old girders. Every care was taken to avoid a jerk, the weight of the girders being considerable. The timbers upon which the girders were rolled were kept in some 2 ft. from the end of each girder, and when they were central they were lifted up to the needles (as shown in Fig. 6) by two jacks at each end, care being taken to lift them level and not to force them against the needles after they were lifted "home." The riveting on the girders was countersunk where they came opposite the needles, necessitating the position of these latter being very accurately measured when fixing them. The girders were drilled and bolted to the needles, after which the jacks were lowered out and the supports taken away.

Grillages of rolled steel joists and concrete for the columns had in the meantime been put in, with the exception of the top layer of joists forming the grillage, and the columns, of cast iron 12 ins. in diameter and 20 ft. in height, were then passed carefully through the shoring from the ends of the building and up-ended, and, while still on the tackle, bolted to the girders. The top layer of joists was then put in, and in the $\frac{1}{4}$ in. gap between the base of the column, which by careful measurement had been left, a tapered steel wedge was inserted over every joist and driven in tight. Each column was wedged up in this way before the weight of the next was put upon the girder, and

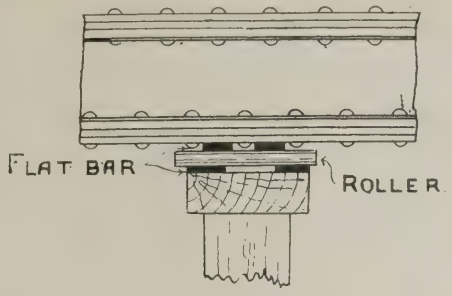


FIG. 5. BARS TO CLEAR RIVETS FROM ROLLERS.

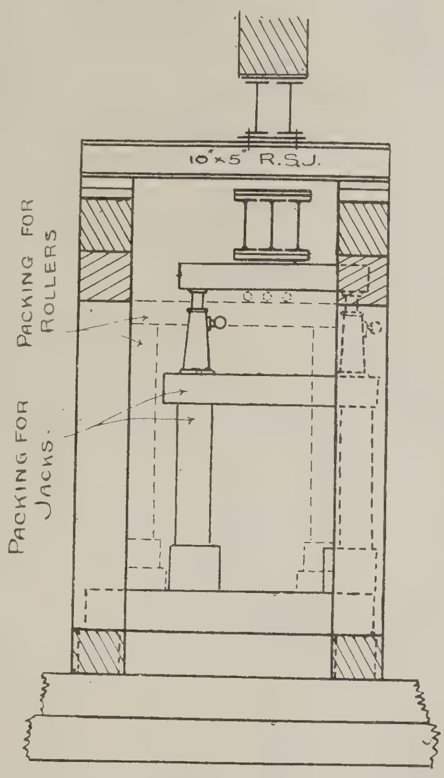


FIG. 6. TOP BAY OF SHORING: RAISING NEW GIRDER BY JACKS.

when finished the column base and top layer of the grillage were well grouted with neat Portland cement. When all the columns were in, and the shoring had been struck, the needles of 8 in. by 6 in. joist were sawn off with back-saws outside; the ends within the building, being very short (owing to the shoring being out of centre) were not cut, but boxed-in in the ceiling.

It is worth noting that although the weight of the building had forced the oak wedges into the top transome of shoring, forming a depression in some cases of about $\frac{1}{8}$th in., they were knocked away without difficulty after the steel wedges were driven in, showing that care is advisable not to drive these too hard so as to lift unequally.

Before the work was undertaken, there was a crack in the corner of the building, extending up two storeys. This was carefully watched, but had not extended nor widened at the completion of the job.

---

223 APPLICANTS FOR A BUILDING SURVEYORSHIP.—For the post of building surveyor under the Portsmouth Corporation, carrying a salary of £120 a year, with training in an architect's office as a necessary qualification, no fewer than 223 applications have been received.

THE DECORATION OF STEEL AND REINFORCED CONCRETE STRUCTURES.*

By James Salmon, F.R.I.B.A.

Architecture, if it can be distinguished from Building, is the part which appeals to the soul as the other part serves the body. If the doctrine that "The use transcends the beauty" were universally adopted, life on this planet would become three times more undesirable than Hell has ever been depicted.

Beauty transcends utility as the Gods transcend the brutes. But do not misunderstand—utility, the highest utility, must first be supplied. The body must be unconscious of its existence if the mind is to be free. Absolute comfort of the body, so far as lies in our power, must first be given.

Financial Aspect.

A great many of the buildings which we have to design are tested from a financier's point of view. Especially is this the case among the buildings in which the type of construction we are now considering is adopted.

And the financial point of view is a very good point of view as a test.

If a large block of offices is put up by someone, and you are acting as architect (presumably advising that it is a profitable speculation, and certainly arranging the details and general scheme), after completion, as this venture pays or does not pay, you get credit or blame. One very difficult question will face you all the time. Will any ornamental elaboration produce a profitable return at all, and, if so, how much? Of course, I do not advise, even from a financial point of view, "playing to the gallery" nor to the stalls, nor even to the critics. Nothing pleases the stalls so much as playing a bit over their heads, and critics are always most grateful to people who give them something new to find fault with.

Ugliness.

What makes most buildings so appallingly ugly is the effort to make them look well. Many builders who are quite certain that negroes with bones stuck through their ears and noses are spoiling any beauty they ever had, go on doing similar things with their atrocious tenements. Great masses of tenements at night, or under atmospheric conditions which obliterate or subdue the fearful attempts at decoration, may look quite fine. The grandest beauties are those of mass, great planes of monotone—the sky and sea, mountain ranges in silhouette, vast deserts.

You must realise, however, that Nature's masses of apparent monotone are composed of innumerable particles of varying colours, and often, as on our hillsides, countless millions of ornaments, each infinitely more complex than Man's most elaborate jewellery, are scattered merely to produce a purple grey. Last year Mr. Hornel showed us, in his individual and interesting way, how in Nature we see the most intricate gems set against an almost limitless mass—a wild rose against the sea. But we all have been struck with such contrasts—a birch tree against a summer sky, a robin redbreast whistling at his toilet on a bough against an expanse of winter snow.

America.

America's antediluvian ideas and want

*A paper read before the Glasgow Institute of Architects on March 11th, 1908.

of originality is a great hindrance to architectural development. Many people have an idea that Americans are original. That shows a great error in the conception of originality. I have never seen or heard of any single thing or thought which originated in America, unless some musical melodies from the negroes and their social life, which is superior to that of the millionaire class. Of course, they have done everything that has been done by anyone else, and done it broader, thicker, deeper, higher, harder, longer, and quicker, but these qualities do not make it a new thing.

A phonograph is a machine for doing over again something which has already been done, only doing it infinitely worse. Edison's idea of architecture is to make three-rooms-and-a-kitchen "Italian" villas by means of cement squirts, etc. The squirty part costs £500 only, but the moulds cost £5,000.

What Originality is.

No! originality is the expression of creative power—the development of new pathways of thought in the brain, the conception of a new sensation, the embodiment of an idea hitherto unrealised.

Now, original conceptions don't fly out of people's heads ready-made. They are slowly built up through thousands of years: a great man here and there gives one a big lift forward, but never very far. His own brain cannot suddenly change its structure, and the brains of his contemporaries can hardly adapt themselves to even a part of his conception.

I am certain that no great masterpiece of music, painting, sculpture, or architecture, of engineering, science, or statesmanship was ever done without—*first*, marvellously complex coincidences of ancestry; *second*, a great knowledge of the collected experience of past ages; and *third*, a life devoted to the art or science involved. Artists have to be first born, then made, and largely self-made.

Classic and Gothic.

People speak of Classic and Gothic as styles of architecture which can be distinguished by external forms. This is not so. Classic architecture was the architecture evolved in what are known as the Classic periods by the Greeks and Romans respectively, and it is nothing else. Nothing done since, nothing done now, nothing which will be done, will be classic. It may become *a* classic, but it never will be Greek or Roman Classic architecture.

Gothic architecture is the architecture done in the Gothic period in Western Europe, and nothing else. Nothing done since is Gothic architecture.

Classic and Gothic had this in common, as the main principle—that they were evolutions of new phases. This fact makes every revival diametrically opposed to them in essence. The Gothic Revival especially (because most servile) was diametrically opposed in principle to the real Gothic.

All architecture which imitates the letter of past styles instead of the spirit is superficial and dead.

The pre-Raphaelite movement in painting (in so far as superficial imitation and outward forms and methods go), the Gothic Revival, and all modern revivals, are merely waxworks.

Use of Materials.

The Gothic builders used all materials they found to their hands in a way suited to the nature of the materials—stone and timber, lead and copper, brass and iron, silver and gold, cloths, silks, glass, jewels, pottery, and the rest. They were not ashamed of their methods of construction, but revelled in them, and in the accentuation of construction produced the most magnificent effects.

A great deal of the delight we have in standing in a Gothic cathedral is produced by our knowledge of history. The greater our knowledge the more intimately can we picture past events which have taken place within and without those walls. No modern imitation Gothic can produce that effect.

New Materials.

We, as human beings, have new materials superior in many ways to anything which former ages possessed. Let us use them, helped but unhampered by anything done in the past. We want buildings, houses, workshops, places of worship and pleasure, schools, hospitals, prisons, roads and bridges, railways and docks. Let us build them as we wish them, and send to Limbo every pedantic stylist who would lay down laws of etiquette. People at the present time in Britain—Britain more than any other place in eternity — have hidden every reality under a wilderness of would-be decoration. All the real plain meaning of things is concealed with flourishes and whigmaleeries. A wall is no longer a wall, but a surface on which to plaster a thousand absurdities, commencing with an abominable wallpaper (there is no other kind). The streets in Glasgow contain 10,000 times 10,000 ornaments—evidence that people have lost all sense of the beauty and splendour of real things.

A house is a good thing. The houses of a million people in one city is a wonderful thing. A great, long, crowded street, with houses all along both sides, is a fine thing. But you can't see this in Glasgow for this infernal conglomeration of ornaments.

The Work of Architects

should be to make buildings that would be beautiful in the general scheme of things—beautiful without ornament. No building which is ugly without ornament will ever be made lovely however much it may be decorated. In fact, as an ugly woman, loudly dressed and hung with jewellery, accentuates her want of charm, so does a poorly composed structure call attention to its deficiencies by its embellishments.

Design all buildings without decorations, and only when the design begins to live as a real thing think of decoration. When your Galatea comes to life you may present her with a few jewels and a little clothing.

Futile Decoration.

If half the energy which has been spent on futile decoration during the past fifty years had been directed to more useful purposes, what magnificent treasures we might now possess. How much more would architecture be looked up to. It might be universally acknowledged as the greatest source of material blessings to humanity. And now in these hard times let us put our house in order, and study economy. Eliminate the unnecessary excrescences which have grown up over our methods. Let us have a spring cleaning of our mental reservoirs, and sweep out a great deal of our out-of-date pedantic knowledge. Forget the details of the examination papers on the history of styles, and study ancient models, not for the purpose of calculating the relative proportions of parts, but only of wrenching from them the meaning of life. The soul must be ministered to as well as the body. A high phase of beauty is grandeur, and grandeur is expressed in vast and enormous plain masses, relieved only by the accidental textures which Nature will supply without stint to those who appreciate her. It is strange to see how those natural textures with which Nature clothes all architecture are disposed on buildings which are out of sympathy with the scheme of things. They reduce these false things first to laughing-stocks, smudging them with dirt and weird stains, and at the last smothering and hiding them from any notice; while with buildings in tune with the world the same toning, instead of dirty splashes, becomes a tender garment graciously accentuating the beauties of form with resplendent colours.

Building Regulations.

Building regulations are an important factor in determining the general form of our buildings. In London the Acts allow a certain height to the parapet in relation to the width of the street, with a maximum of 100 feet, and then besides this allow two storeys in the roofs. This leads to a certain form of building in some ways good, but the conditions seem to me in a measure arbitrarily absurd.

In Glasgow we can go straight up pretty much as in London to a maximum of 100 feet, which may be a flat roof or the ridge of a gable. We daren't put more than one storey in a roof. Of course, these Acts are no sooner passed than they are out-of-date.

The clauses about one or two storeys in a roof are framed with the idea of inflammable roofs, but are applied to all roofs, however safe. This is an outrage.

I have no objection to a limit being fixed as to the height of buildings, but it might be applied in a more scientific way.

There is a grevious mistake in our last Act, and I think this Society of ours should formulate a strong protest to the Government on the subject.

In regard to height of buildings, I would suggest that the clause stand as regards height, but that an owner be allowed to carry the features of the building 30 feet higher, provided that the cubic bulk did not exceed an equivalent of a building 10 feet higher (ignoring all walls or projections). Allow any number of storeys in a fireproof roof.

Fix the stair and exit areas according to the number of occupants.

All this has a direct bearing on my subject, as you run against those Acts before you get well started, and I trust a joint committee of various interested bodies will at once be formed to free this community from these chains and trammels. We should be allowed to appear before the Dean of Guild Court and explain any scheme proposed for our clients which could be passed on its merits independent of any Act whatever. Why should a good thing be objected to because it is contrary to by-law number so-and-so? The only valid objection should be that it is bad, and not good. Let us simply show that a scheme is good, and let the Master of Works, if he can, show if it is in any way bad. Let him issue some suggestions, but do not let these become binding laws, like those of the Medes and Persians, which legislated those hide-bound nations out of existence.

The Age of Reinforced Concrete.

I am surprised that no large firm in Glasgow has taken up reinforced concrete construction, as it is one of the biggest industries of the immediate future, if not of the present time.

I believe that very shortly roadways in cities will be laid with nothing else from building line to building line.

Schools.

A class of building where reinforced concrete construction could be used to great advantage is that of schools. It is absolutely fireproof, so much so that insurance is unnecessary; far healthier, as much less lodgment for dirt and for disease germs is afforded; and it is quicker to erect. Of course, the Education Department will only realise this in time to adopt the construction when it is out of date.

Knowledge as Affecting Appreciation.

A knowledge of the nature and properties of the material are necessary in the beholder if he is to appreciate the æsthetic effect.

How much does the wonderful construction of the world appeal to those who have knowledge of the wonderful interrelation of forces which exist?

Consider how much greater must be the appreciation of an astronomer for the heavens to that of a person ignorant of the scale and movements of the stars.

How much more a moth is to a entomologist than to an anxious housewife. A botanist sees more in an orchid than a jockey would.

A seaman can appreciate the lines of a ship better than a landsman, and the knowledge of modern battleship construction gives a naval officer an eye for the beauties of a modern battleship which those ignorant fail to see.

So, before a person is qualified to criticise reinforced concrete construction, he must be educated as to the nature of this material. Just as I consider that no one can design woodwork until he knows what woodwork is—until he has felled it, sawn it, planed it, chiselled it, hammered nails into it, and familiarised himself with it in every way; so I consider that a close study should be made of reinforced concrete, and especially should one take many opportunities of witnessing tests to destruction of reinforced concrete beams, slabs, and pillars.

Repetition of Ornament.

I should like to say a word in regard to the repetition of ornaments. There is no doubt that a series of ornaments repeated in some measure of rhythm may have a good effect. But if these are examined one by one, and found to be similar, a sense of disappointment is experienced. Examination in detail is given up; interest in each individual ornament ceases. Not one of them (and we need only look at one)—not one of them interests so much as each one would have done had it been unique. We find, then, that to repeat an ornament is to reduce the total value of them all to less than one would have possessed. Consequently, two are less than one, neither possessing the uniqueness which gives the necessary finish to our satisfaction on close study of a beautiful object. I am against all reproductions in works of beauty. Perhaps the most difficult obstacle to this argument is provided by the question of etchings. We know that if the impressions are limited their value increases; that if only twenty are taken each is more valuable than if fifty are made. Well, if I were a famous etcher, I would like to try the experiment of printing about a dozen and then destroying the plate and all the impressions save that which I held best.

This brings us to another question—the question of

The Directness of the Craftsman's Touch.

In an etching, the touch is indirect, is, indeed, twice removed, for the etcher simply removes the wax from the copper, and the acid bath cuts the grooves which are afterwards filled with ink, and this is transferred to the paper.

A bronze casting is nearer to the artist's hand. He sees the exact shape in the clay as he models it, and he completes his work on the bronze itself.

But these are illustrations. Let us consider some materials which are used on buildings.

We have all seen terra-cotta glazed and unglazed. Most of us have seen far more than we wanted to, and it is nearly all of the repetition order, which should be condemned when it pretends to be interesting. It is not interesting to me; it gives me pain to see it and to think of it. But there have been terra-cottas which were delightful—they were all made in a very different manner from what we are accustomed to to-day.

The Tanagra figures—the vases and bowls of ancient Greece—the glazed terra-cottas of the Della Robbia family were all direct hand work, not exactly as they left the artist's hands, for they shrink twice—first while drying, and secondly during firing; but more interesting on that account, as the touch of Nature is added to the handiwork of man.

Now, there is no reason why we should not revive this method if we wish. To do architecture in terra-cotta, all you require is a good sculptor who could model your whole facade in clay, piece by piece. Each piece would slowly dry, then be kiln-dried into biscuit, then dipped in glaze and fixed. This would be a fascinating thing to do. Every piece would be interesting; repetition would be a trouble, instead of an economy; all sorts of colour schemes would suggest themselves. You have a wide range of underglaze colours to play with, and yet they are sufficiently limited to prevent your getting lost in an infinite selection. One or two points should be noted, and I am indebted to Johan Keller for much information on these points, as he has made the drying and firing of clay models a special study. After the Della Robbias had finished their model they worked on the back of it, cutting away the clay so as to obtain, as far as possible, a uniform thickness of clay. This is very necessary if it is to fire properly. And when they could not get behind the model, as in detached figures, they had an ingenious plan of building up a core composed of inflammable material, which burned out and allowed the heat of the kiln to get at both sides. A large, solid clay model would be impossible to fire properly.

Tile Work in Reinforced Concrete.

A material which I was delighted to find was Rust's vitreous tiles. They are cut to any size, from about 9in. by 6in. downwards, and I have no doubt could be got in various shapes if wanted. They are made in delightful colours, and should stand any atmosphere. Ordinary tiles will not stand outside in our country.

Adamsez make some very hard burned tiles of beautiful colours and textures, but fairly dear, while you all know Van Straaten's charming plain hand-made Dutch tiles, which, however, are not so hard-burned as Adamsez. I have tried several times to get an opportunity of using glazed roof tiles and chimney cans, but have not yet found a client with enough money.

In Spain the effect of domed roofs laid with blue glazed Italian-shaped tiles is superb. The blues are by no means uniform, varying in every tile, which adds to the sparkle.

In using tiles in reinforced concrete work, I think they should be used only to give points of colour. You must not start out with the idea that concrete is ugly grey stuff, which must be hidden up, but you must add touches of colour so as to cause the grey of the concrete to assume a beauty by contrast. Thus, if you used touches of cool deep blue and blue-green tiles, the concrete would appear warmer. And in setting the tiles into the wall they should not touch each other, but the concrete should run through between them, and so weave them into the surface of the wall. Of course, tiles are not the only things which you can apply. Some of you have seen cottage gables on the coast of Fife, which have been made interesting with a mosaic of shells set into the cement coating. And not shells only, but the butt ends of bottles, and pebbles of various sizes set in concentric circles round, perhaps, an old saucer for a centre.

National Tradition.

I think that, artistically, each nation should do as much as possible to preserve a distinctive character. I don't think that we should copy the work of our Scottish ancestors, but we should develop our style on our own lines. If things go on as they are doing, every place will require to have its name and address put on the lamp-posts, for you can hardly tell whether you are in Germany, Britain, or France from the look of places nor the dresses of the people, and it is really only by the railway tickets and the care of the railway officials that we know where we are.

Adaptation of the Scottish Style.

The Scottish style, I mean especially that of the old rough-cast castle, is eminently adapted to a development suited to reinforced concrete construction—the plain rough-cast surfaces, extending to the window-sashes, the simple corbelling, the small cornices, the straight lines, the rarity of arches, and other details difficult to construct: above all, the freedom to do anything you like, provided the shapes suit your material wants, and group well with the natural surroundings.

I find an inspiring source of ideas in the illustrations to fairy tales by Miller in the "Strand Magazine." Some of his palaces in which princesses are kept in durance by wicked demons would do well in reinforced concrete.

Of course, nowadays we must have big windows, and plenty of them, but sky-lines can be got as fine to-day as ever they could, and you can corbel in steel or reinforced concrete as no one could corbel before, and you can span openings that up till a few years ago were impossible.

Surface Texture.

As you know, the concrete is filled into moulds known as centering, which is usually formed of wood planks, and it is difficult to arrange these without reproducing the joints in the finished concrete. Here and there a plank is a little out of the general plane, and as a rule the grain of the wood is visibly reproduced on

the concrete surface. There are patches of smooth cement and patches of a rougher character where the concrete has been drier and the granular aggregate is visible. To overcome this and obtain a regular surface texture various means have been adopted. One is to coat the whole surface with a rendering coat of mortar, say, two or two-and-a-half of sand to one of cement. This may be rough-cast in whole or in parts. Another method is to pick the surface where required and rub it with water. Another is to chisel grooves across it at close intervals. Another is to remove the centering before the surface is hard, and wash and rub down.

Another method is to press a tool like a chopper downwards between the centering and the concrete. This is done all along the wall after each layer is laid, and turns over any stones which are projecting. The surface is usually washed and scrubbed after the centering is removed, and before the concrete has become too hard.

Another method is to line the centering with paper; coating the centering with black soap, oil, or some such material is often done.

Simple mouldings can be formed in the centering, but these should be such as suit the nature of the centering and the nature of the concrete. These can be finished with rendering, or formed complete by the centering alone. Mouldings finished in rendering are run with a reverse template in the same way as plaster cornices.

Elaborate Ornament.

If an elaborate ornament is wanted, it can be moulded full size in clay, over which a plaster mould is made. When this is dry the clay is extracted, the inside thoroughly coated with black soap. A layer of fine cement mortar is then laid in to a depth of about an inch, steel rods are then bent to fit the interior space with connections to project into the walls of the building, and the remaining space is then nearly filled with concrete. The whole affair is then placed in position, and the remainder of the space is filled, together with those parts of the wall which adjoin. For certain ornaments the plaster mould can be placed in position before any filling is done.

In both cases the plaster model must be carefully supported until the ornament and walls are well set, when it can be removed and perhaps chipped off. Sometimes it is better where one mould can be used for a series of ornaments to cast those ornaments complete with steel connections projecting, and when quite hard frame them into the centering.

Modelling Direct on a Building.

On the Continent there are many modellers who have great skill in modelling ornament direct on the building, and this has to be done entirely with trowels and tools, as the cement burns the hands, and no gloves can last more than a few minutes, owing to the granular nature of the mortar. Mr. Keller has been experimenting, and knows the system well, which has some secrets. He tells me that one afternoon in Brussels, while on his way to an audience with King Leopold and the Marquis de Brabant, he suddenly remembered that he had omitted a large relief composed of 9ft. angels. Having no time to change his dress, he gained the scaffold, and at lighting speed threw on to the wall with a trowel these gigantic figure reliefs, and then entered the audience chamber without a spot on his costume.

Some Suggestions in regard to Steel-Frame Buildings.

There are many ways of treating steel frame buildings which are seldom tried. One method which I have not seen done, but which would be most interesting to work out, is to use nothing but steel for the supports, walls, and windows, building the walls as a steel ship is built, making use of the lines of rivets and joints of the plates. Beautiful balconies could be constructed with wrought-iron railings, and many forms would suggest themselves.

If not steel, then copper or lead could be used. Copper is harder and better where fire might occur, and the plates could be beaten into fine shapes. There are also those composition metals to be had—thin steel plates with thin surfaces of brass or aluminium.

The great point for architects is to have great ideas, to ignore the prejudices of the brief time in which we happen to live, and to design and build for eternity according to our lights; to learn from Nature how she adapts all materials to her purposes, and while always changing knows no fashions; how she uses great masses, and also rich and elaborate details.

We are only a part of Nature, and must design our little pieces so as to form part of the whole world, the general beauty of which has a tendency to become spoilt by side-shows.

Treatment of Interiors.

Strong cement mixtures are almost non-porous. The moisture contained in the atmosphere of warm rooms condensing on the walls when these happen to be cooler than the air of the room collects on the surface, and, forming into drops, runs down. You find this on non-porous materials such as marble, whinstone, glass, and cement surfaces. When the surface of the walls is of sandstone or plaster, wood or paper, the moisture collects, but is absorbed as it collects, and is not seen. It should be dried again when the walls become heated, or when a current of colder air passing over the surface takes up the moisture.

If there are objections to the collecting moisture becoming noticeable, a thin finishing coat of plaster is sufficient in most cases, and this brings us to plaster as a material for internal treatment. And in regard to plaster, I would say never use any ornament unless you know why you use it. Cornices and mouldings look worse than nothing if they come to awkward ends and angles. Reliefs should be such as are naturally modelled in a plastic substance.

You have to be careful in passing floor plans, as the arrangement of subsidiary beams determines the treatment of the ceilings below. The floor can be made in plain slabs between the main beams if it is thick enough and sufficiently reinforced, but it may be more economical to adopt subsidiary beams with a thinner floor slab, in which case these must be spaced with care.

The Folly of Imitating Stone.

It is an utter mistake to imitate stone in concrete. I am very sorry to see this done so much. These imitations are so unsuccessful. They are designed, of course, by men who could not successfully imitate a good stone building even in stone. It is the same guilty feeling which caused people to make the early radiators look like umbrella stands or dressing tables, the early electroliers like gas fittings, motor-cars like wagonettes, etc.

Things should express their purpose, and if their purpose is one to be ashamed of they should not exist.

Colour of Concrete.

The colour of concrete is an important question. It varies with the brand of cement, with the colour of the sand, with the time of setting. Some cements are a cold, light bluey-grey, and range from that to pale buff. Sands vary much more. The aggregate has also a little effect, especially if the concrete is mixed dry.

You must exercise great care in the selection and mixing of materials and also design to suit the concrete. A design in the spirit of Castle Frazer is independent of a few variations in the colour.

Of course, the whole building can be whitewashed or painted.

Conclusion.

I consider that a great deal of harm is done by the way in which building construction is taught. The books and lectures on this subject are mixed up with all sorts of things which are not construction at all, but are meant for decoration, and as a rule the most vile and abominable decoration that can be conceived. The result is that every house is loaded with meaningless ugliness, and every tradesman—mason, joiner, plasterer, painter, etc., has his mind loaded with the means of poisoning the world with the atrocities which surround us at every turn. Of course, among those called architects are many of the most prolific sources of this diseased and hideous curse of vile ornament.

Avoid like a plague all decoration which you do not understand.

Design any building you like, but leave off every unnecessary feature, every moulding, every fitting which shows a trace of decoration so-called. Don't for the sake of heaven and earth think for a moment of being artistic, or you are lost. Be sane and sensible; ignore all teaching and everything that anyone has ever said about art or style, and be only practical and all these things shall be added unto you. Copy nothing. Obey no one. If a man asks for beauty, tell him that beauty is the absence of ugliness. Among the finest buildings in Britain are those which have been done without any idea of architecture—whitewashed farms, workshops, mills, and docks. Every touch which suggests an attempt at architecture is a blemish in these. How magnificent are the works of those engineers who have avoided "architecture."

"Beauty unadorned is adorned the most."

Ruskin is fundamentally wrong when he says that architecture must be carefully distinguished from building. Building is architecture. If we could found a school of architecture which stuck to the sane building of buildings, getting down to the bedrock of absolute economy, we would exercise a good and powerful influence on methods of building throughout the world, and gradually reduce the pet creations of the flash builder and flash architect to objects of pity or perhaps amusement.

Architects are not employed for certain classes of buildings at present, because the owners imagine that they would add expensive features to them, and this idea has good grounds. But the designers of these buildings (engineers or mill architects) as a rule stick on very expensive and very hideous embellishments.

An architect should be, first of all, an engineer, not necessarily a calculator of the bending moments of beams, but one

who could take a general view of the requirements of an industry and design a scheme of buildings in which that industry could be economically carried on.

If this new material, reinforced concrete, could induce us to drop all the ridiculous accretions of absurdities which we plaster on to stone, it will indeed have lifted a weight from a world overladen with "ornaments" and "decorations."

We have everything they had in the past, and, in addition, a material called steel, which should enable us, were we but willing, to build cities which would be ten times more wonderful than Babylon, and last a hundred times as long. A material by which all risk of fire, waking or sleeping, could be done away with. And yet our people are so slow, so canny, that generations are destroyed with a disease because they are afraid the cure will impair their health.

REINFORCED CONCRETE SYSTEMS.

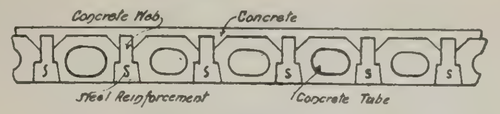
No. XIX.—The "Herbst" System.

On the Continent a vast amount of work has been done on the tubular flooring system invented by Mr. William Herbst, civil engineer, of Berlin, and it is now being worked in this country by the Armoured Tubular Flooring Co., Ltd., of 53, Victoria Street, Westminster, who are the sole licensees for the United Kingdom.

The Herbst system is patented in most countries, and has gained some excellent awards. In the United Kingdom the patent is dated March 29th, 1904, and is numbered 7,457. The patent is uncommon in its simplicity—so much so that one might watch the laying of the floor (consisting, as it does, of reinforced concrete) without being aware that steel in any form was present, if unacquainted with the manufacture of the webs or ribs. The simplicity of the "Armoured Tubular Floor," together with the carefulness on the part of the Company to obtain the best results, impress one favourably towards the finished product.

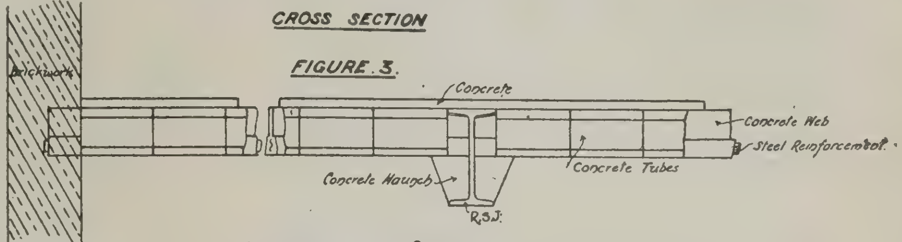
The engineer or the architect may work out his designs in reinforced concrete with the closest attention to details, may calculate his strains to the greatest nicety, but the quality pre-eminently needed by the finished product is carefulness of manufacture. Without this, all the others count for little. It follows, then, that this essential quality will be more certainly supplied by the specialised workmen and the close supervision of a company who have to succeed or fail by the character of their manufacture than it will be supplied, in average circumstances, by the variable conditions of training in labour and skill in construction employed under building contracts.

FIGURE. 2.



CROSS SECTION

FIGURE. 3.



LONGITUDINAL SECTION

FIG. 4. VIEW SHOWING SOFFIT OF FLOOR (21-FT. SPAN).

It might be mentioned that owing to its many good qualities, its apparent contrast, novelty, and complete revolution of construction, as compared with the older and traditional methods of flooring of other concrete constructors, this system of the Armoured Tubular Floor has been adopted by the technical schools and colleges in Germany, and included in the subject of concrete construction as a unique and distinct principle of its own.

In 1904 the Armoured Tubular Floor was approved by the Royal Works Director at Berlin for spans of 17ft. Loading tests have shown a factor of safety of 10 at 21ft. spans, and at a Cologne hospital spans of 30ft. have been laid. During the first six months' working in Germany the floor was used in 51 buildings

The Construction of the Floor.

Fig. 1 clearly shows the construction of the Herbst floor, which consists of :—

(1) *Concrete webs or ribs*, marked A, in the lower part of which a corrugated steel reinforced bar of special design is embedded. It will be observed that the webs are very narrow in proportion to their height, so that they present a very high supporting strength. The concrete is made of suitable aggregate and the best Portland cement in the proportion of 3 to 1.

(2) *Light Hollow Tubes*, B, 9ins. long, of best cinder concrete in the proportion of 6 to 1.

(3) *A Top Layer*, C, of concrete similar to the webs.

The webs and tubes are made at the company's various works, and, conquently, are set and matured when delivered to the buildings, enabling the entire floor to be assembled in the simplest possible manner. In constructing the floor the webs are first placed in the proper position, the tubes are put in between, and the top layer of concrete is then spread over the whole and finished as per specification. The underside of the floor may be left as laid or plastered, as desired.

The Works.

The company, employing all British labour and all British materials, have their works at 56a, Leighton Road, Kentish Town, where the manufacture of the concrete webs and hollow tubes is carried on.

The concrete webs are made on benches (Fig. 5). The fresh webs remain on the

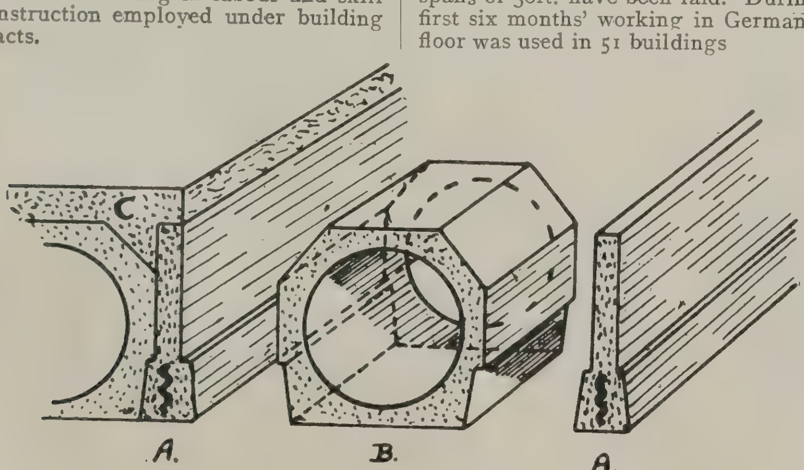


FIG. 1. THE ARMOURED TUBULAR FLOOR: HERBST SYSTEM.
A A, Concrete Webs; B, Concrete Tube; C, Top Layer of Concrete

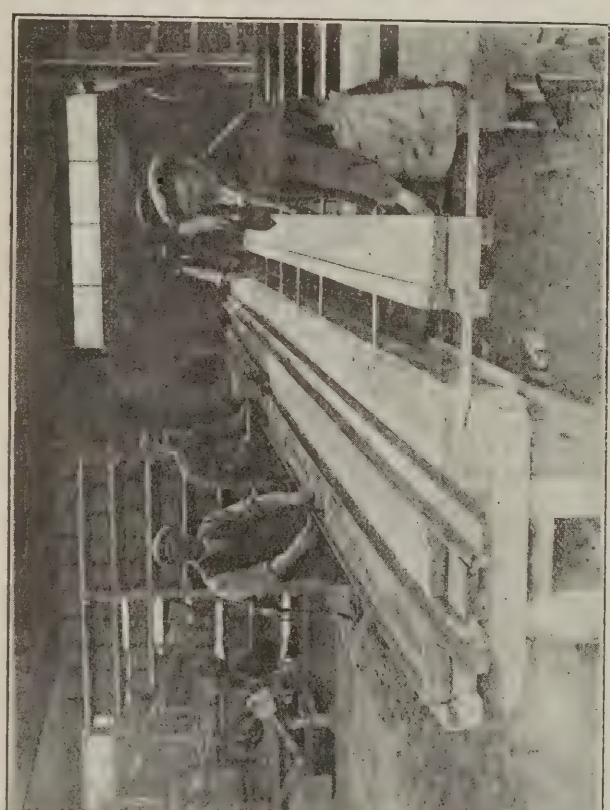


FIG. 5. MANUFACTURE OF CONCRETE WEBS ON BENCHES.

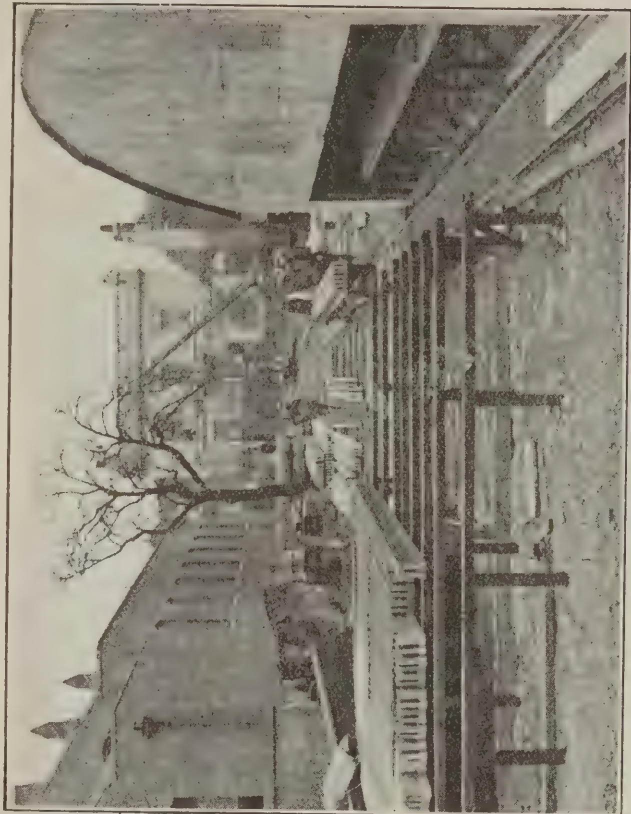


FIG. 6.—CONCRETE WEBS IN YARD.

FIG. 7. PATENT TUBE PRESS.

FIG. 8. PORTABLE TUBE PRESS, WITH ATTACHMENTS FOR VARIOUS SIZES.

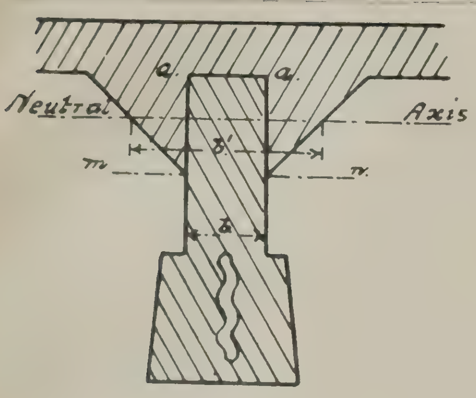


FIG. 9.

forming boards for three days, and are then turned up and left in the yard to set (Fig.6).

For the manufacture of the tubes, hand presses turning out four tubes at a time are used (Fig. 7). If there is sufficient space, the company make their tubes at the site of the building, and have for this purpose small and therefore easily transportable hand presses, which can be adjusted for the various standard sizes (these are shown in Fig. 8, together with moulds of various sizes, and base plates upon which the tubes are removed to the stack).

No Centering.

No centering whatever is required in constructing the Armoured Tubular Floor, but as workmen of other trades are allowed to use the floor the day after the top layer has been laid (obviously a great convenience), a single row of strutting (in the case of spans exceeding 16 ft., two rows) is placed under the floor as a precautionary measure. This strutting is fixed to the steelwork without supports from below, thus entirely avoiding obstruction to the builder.

Theory.

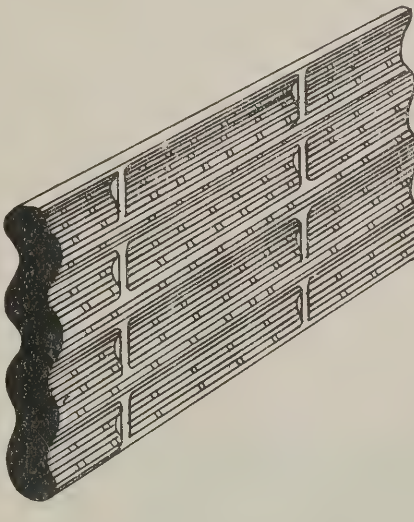
Examining now its theoretical points, the Armoured Tubular Floor is, as previously mentioned, constructed of ribs or webs placed closely together at an average distance of 10ins., centre to centre. The total load on each web is thus a comparatively small one; therefore, the horizontal shearing stresses, which depend upon the vertical loads, do not exceed the limits fixed for them (about 60 to 70 lbs. per sq. in.); consequently, stirrups are not required. In properly constructed Armoured Tubular floors the neutral axis (Fig. 9) as a rule lies above the line $m-n$ (which line indicates the lower end of the corner pieces $a-a$); thus the shearing stresses, which reach their maximum in the neutral axis, are not only taken up by the width b of the web, but by the width b_1.

Adhesion.

As to the adhesive stress, or bond, between the steel reinforcement and the concrete, that depends upon the shearing stresses and the circumference of the steel bar. The calculations show that it does not reach the limit of 100 lbs. per sq. in. allowed for same. This of course is due to the fact that the shearing stresses as a rule are low. Should, however, in a special case, the adhesive stresses exceed the above limit, they can easily be reduced by inserting two bars, each of half of the sectional area required, instead of one big bar.

The Top Layer.

But the most important feature of this system is the arrangement of the top layer. The tubes placed between the webs have rounded or chamfered corners, so that the top layer has the shape as shown in Fig. 10. Thus the fresh concrete of the top layer (which is made *in situ*) gets a firm grip on the old concrete of the webs (which have been made beforehand and have properly set), not only on the top of the webs, but also along the sides of them (a, a), so that the length of the grip $is = b + 2a$. Experiments have shown that the adhesion between the old and the new concrete is so great that, practically speaking, the top layer and the webs form



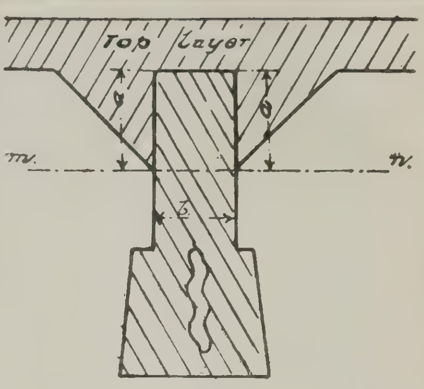


FIG. 10.

a monolith; in fact, in all breaking tests made with Armoured Tubular floors the joints along a, a never opened.

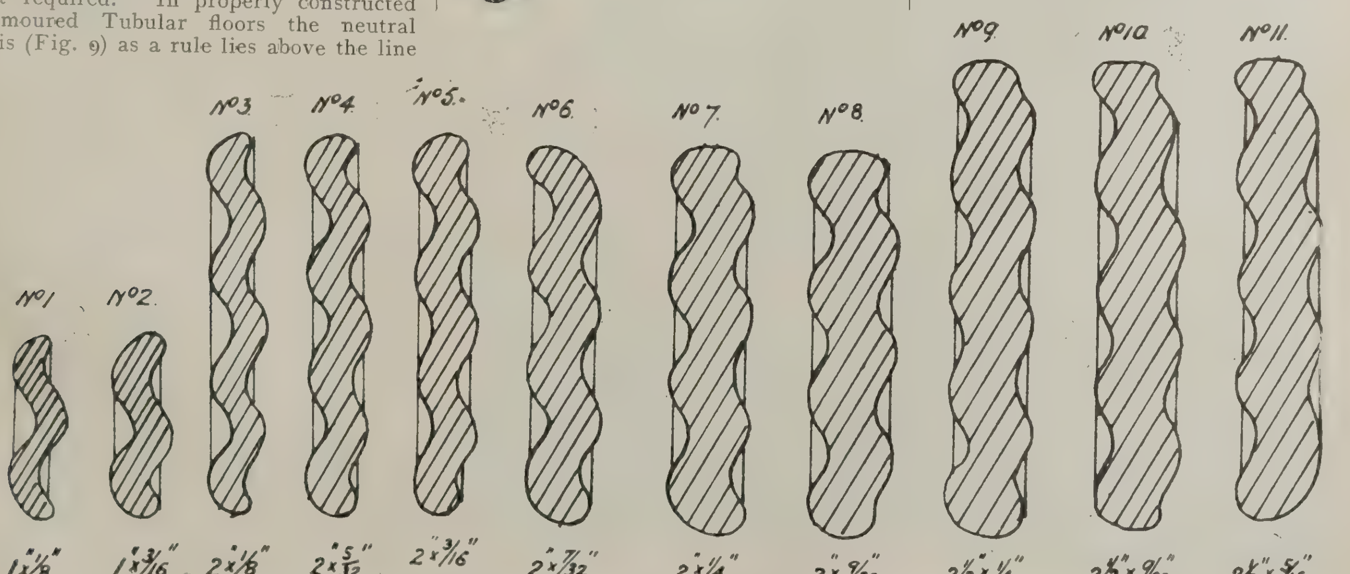
The principle of the floor, as explained above, is never changed, whatever the spans and loads may be. By changing the thickness of the top layer and the section of the steel reinforcement, and by adapting the various standard sizes of webs, the above arrangement can be adopted for spans up to 30ft. and superloads up to $2\frac{1}{2}$ cwts. per sq. ft.

Reinforcement.

The reinforcement used is English mild steel of the standard product, 28 to 32 tons tensile stress per sq. in., etc.

It is well known that iron, by reason of its tendency to expand under great heat, and its liability to bend and break at high temperatures, is a most dangerous material unless protected from the effects of fire. Iron reinforcement should be well protected and placed in such a position as to offer the least possible surface to the action of fire. This is particularly well arranged in the Armoured Tubular Floors, as will be seen from the accompanying illustrations.

No.	Section in inches.	Sectional area in sq. ins.	Per foot weight in lbs.	Sectional area sq. cm.	Per metre weight in kilograms.
1	$1 \times \frac{1}{8}$	0.156	0.56	1.00	0.83
2	$1 \times \frac{3}{16}$	0.234	0.84	1.52	1.25
3	$\times \frac{1}{8}$	0.313	1.12	2.02	1.66
4	$2 \times \frac{5}{32}$	0.387	1.38	2.52	2.07
5	$2 \times \frac{3}{16}$	0.468	1.68	3.03	2.49
6	$2 \times \frac{7}{32}$	0.545	1.96	3.53	2.90
7	$2 \times \frac{1}{4}$	0.625	2.25	4.04	3.31
8	$2 \times \frac{9}{32}$	0.695	2.48	4.53	3.72
9	$2\frac{1}{2} \times \frac{1}{4}$	0.781	2.79	5.05	4.14
10	$2\frac{1}{2} \times \frac{9}{32}$	0 879	3.12	5.67	4.65
11	$2\frac{1}{2} \times \frac{5}{16}$	0.976	3.48	6.30	5.17



ARMOURED TUBULAR FLOORING: STOCK SECTIONS OF REINFORCEMENT ACTUAL SIZE).

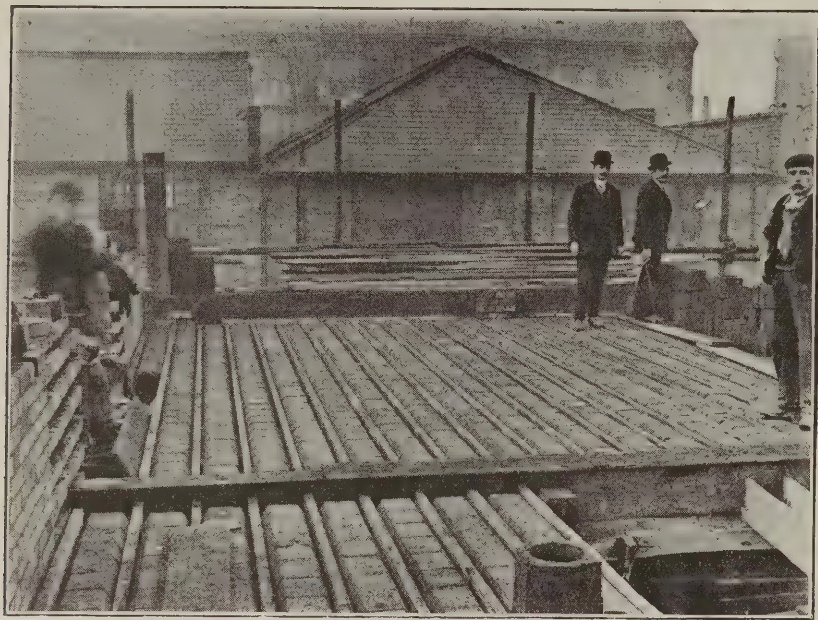


FIG. 12. VIEW SHOWING WEBS AND TUBES IN POSITION (21-FT. SPAN), READY TO RECEIVE TOP LAYER.

The shape adopted for the steel reinforcement, for which the company have a special patent, is the result of numerous experiments and careful consideration, as the webs, in addition to being subjected to handling, answer two different purposes. Firstly, when in position, they act as independent girders, strong enough to carry the deadweight of the floors plus the weight of the workmen. Secondly, after the top layer has been put on, they become an integral part of the finished floor, the concrete of the webs taking up the shearing stresses, and the steel bars the tensile stresses. Being previously manufactured, the webs have, like timber joists, to be hoisted up and placed in position, and therefore must possess as much rigidity as possible, especially with regard to lateral bending or twisting. As ordinary rounds or flats are not suitable, because they possess no lateral stiffness, corrugated sections of various depths and thickness have been adopted, as per schedule (Fig. 11), possessing both in the vertical and in the horizontal plane the maximum rigidity obtainable. Moreover, the corrugations increase the surface of the bars and thereby the bond between steel and concrete, so that the adhesive stresses might even exceed the limit of 100 lbs. per sq. in., without reducing the factor of safety of 4, generally adopted for reinforced concrete work.

Calculations.

The system of calculations adopted for this floor is in accordance with the German regulations, but the compression in the top layer and the tension of the steel reinforcement are ascertained without taking into consideration the strength of the corner pieces *a*, *a*, and this no doubt tends to account for the fact that the Armoured Tubular floors stand higher breaking tests than shown by calculations.

The standard sections of the webs and tubes are 5ins., 6ins., 8ins., 10ins., and 12ins., giving finished floors of a thickness of 6ins. and upwards, according to the spans and the load to be carried. The various sections were decided upon by taking the bending moment of webs for various spans and loads, and classifying the results into groups, for which the most economical depths of webs, thicknesses of top layers, and sections of reinforcement were calculated, aided by experience.

With reference to the spacing of the webs at 10in. centres, the use or necessity of reinforcing the top layer is avoided; besides, the spacing could not well exceed 12in. centres, otherwise the tubes would have to act as integral parts of the structure, which is against the principle or system of the floor, wherein the tubes are used merely as a centering to receive the top layer.

The floor is very light (the dead weight being 44lbs. per sq. ft., and upwards, according to thickness), and, from practical tests, is proved to be thoroughly soundproof.

Owing to the hollow tubes, the use of the floor appears to be specially suitable for schools, hospitals, etc., where warm and well-tempered floors are of special importance.

A fire test was made on January 30th, 1907, at the testing station of the British Fire Prevention Committee in London, during which an Armoured Tubular Floor of 247 ft. super. was exposed to a fire of four hours' duration, the temperature ranging from 1,800 to 2,200 degrees Fahr. followed by the application of water for five minutes. The floor was loaded with 280lbs. per sq. ft. Neither fire nor water passed through the floor; consequently, classification "Full Protection" was obtained.

Two loading tests with the Armoured Tubular floors were made on June 7th and 27th, 1907, respectively, at the Committee's Testing Station as follows:—

(1). A strip of flooring of a width of 2ft. 6ins., with a span of 14ft., calculated to carry a load of $1\frac{1}{2}$ cwts. per ft. super., with a safety factor of 4. The breaking point was only reached after a load of more than 12 cwts. per ft. super. had been put on, being 8 times the safe load for which the floor had been constructed.

(2). A strip of flooring of a width of 2ft. 9ins., with a span of 28ft., calculated to carry a load of 1 cwt. per sq. ft., with a safety factor of 4. This floor withstood a load of $7\frac{1}{2}$ cwts. per ft. super., without breaking.

The following summarises the advantages claimed for the Armoured Tubular Floor:—

(1). Eminently satisfactory from a hygienic point of view, being fireproof, soundproof, warm and well tempered, and of desirable depth of construction.

(2). Omission of I girders effects a saving of steelwork, and consequent diminution of risk in case of fire.

(3). Easily comprehensible and clear static calculations, which admit of the most extensive use of the properties of steel and concrete.

(4). Absolutely even soffit without interruption up to spans of 30ft., whereby the architectural and decorative formation of the ceiling is unimpeded.

(5). Great simplicity in the manufacture of the webs at the factory and the laying of the floors.

(6). Great rapidity of construction.

(7). Little moisture and dampness, the webs and tubes being brought on the site dry and only the top layer laid *in situ.*

FIG. 13. VIEW SHOWING UNDER SIDE OF ARMOURED TUBULAR FLOOR (15-FT. SPAN) AT NEW HUMBER WORKS, COVENTRY: ALSO CONCRETE WEBS ON DRYING RACKS.

(8). Practical suitability of the tubes for ventilation, water pipes, gas pipes, etc.
(9). Low deadweight of floor and high carrying capacity.
(10). Non-existence of centering and consequently no obstruction to builders.
(11). Quick use of floor immediately after construction.
(12). Easy to cut holes, trim for same, replace damaged parts, or to join on continuous construction.

Contracts.

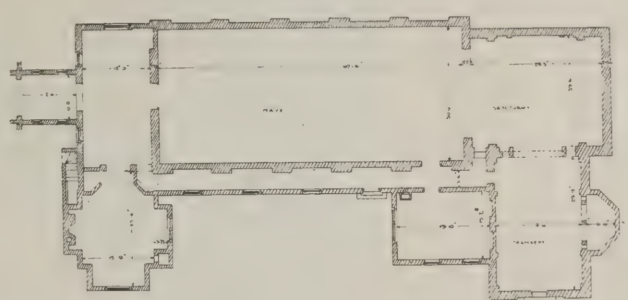
Many hundreds of large buildings, including Government and municipal buildings, have been constructed with the Armoured Tubular Floors in Germany, and the system is also rapidly gaining ground in Austria, Italy, Spain, Belgium, Holland, and Sweden. About 60 licensees have up to the present been appointed for the manufacture of the Armoured Tubular Floor. Amongst the larger buildings now in course of construction in England are a motor omnibus factory at Camden Town and the New Humber cycle and motor works and offices at Coventry.

A REINFORCED CONCRETE CHAPEL.

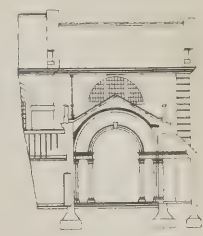
It is commonly believed that reinforced concrete does not lend itself to architectural outlines, and is not adaptable for ornamental curves, panels, and projections. That this is an utter fallacy is clearly shown at the chapel of St. Charles's College, Notting Hill, London, W., where Messrs. D. G. Somerville and Co., of 72, Victoria Street, Westminster, have just completed a series of most complicated barrel-vaulted roofs and a dome. The architects for the work were Messrs. Lamb and North. The main roof over the nave is 68ft. long by 30ft. clear span, and the true height from ground

Photo: Campbell-Gray, Ltd.

Barrel Vault over Nave in Course of Construction.

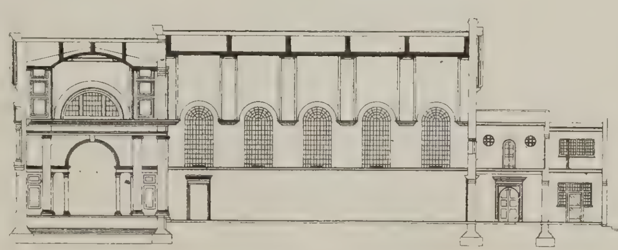


Plan.

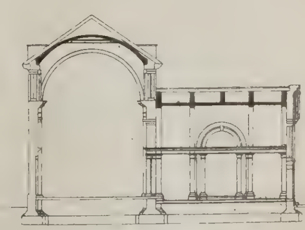


Section through Transept.

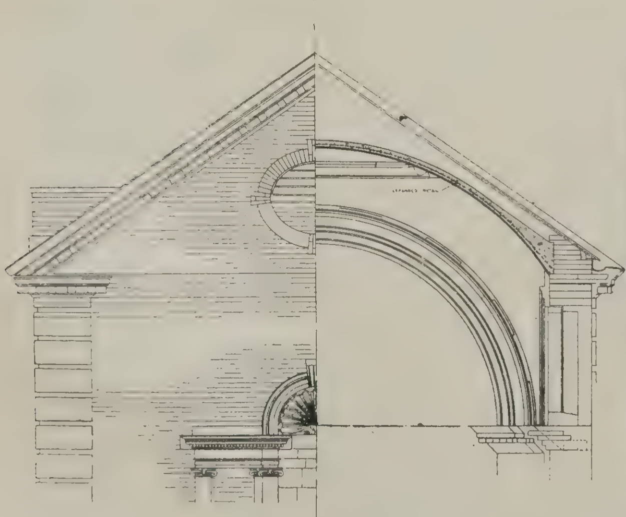
Section through Nave and Sacristy.



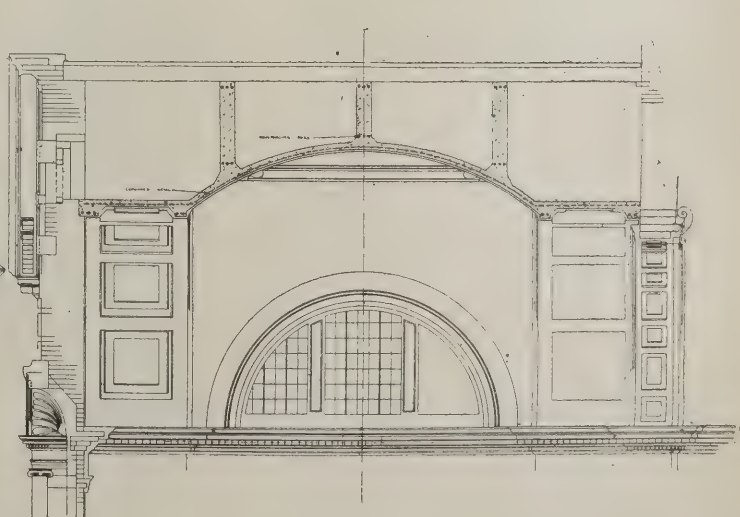
Longitudinal Section.



Section through Sanctuary and Transept

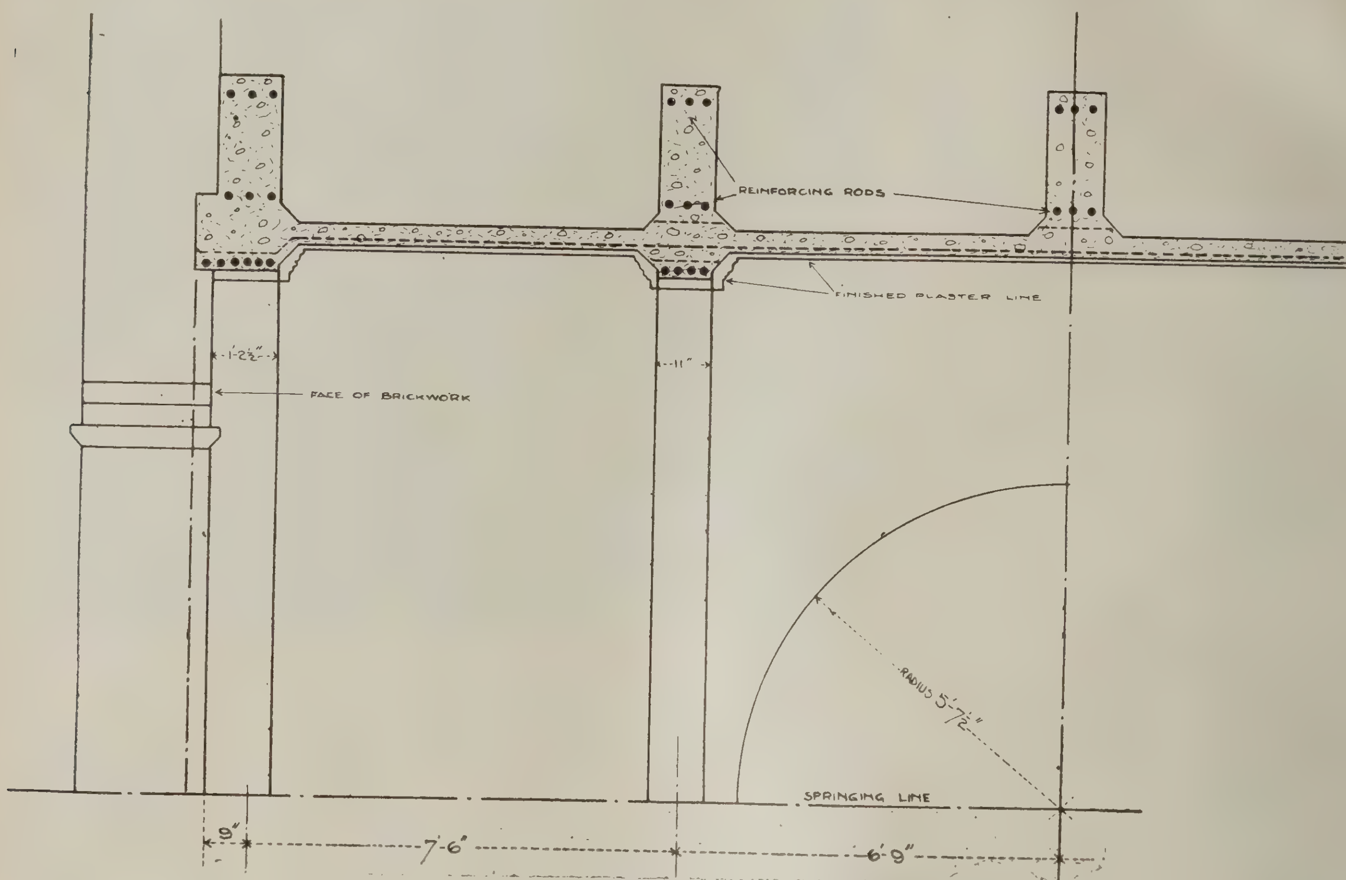


Part Section through Sanctuary.



Cross-Section through Sanctuary.

ST. CHARLES'S COLLEGE CHAPEL, NOTTING HILL, LONDON, W. LAMB AND NORTH, ARCHITECTS.

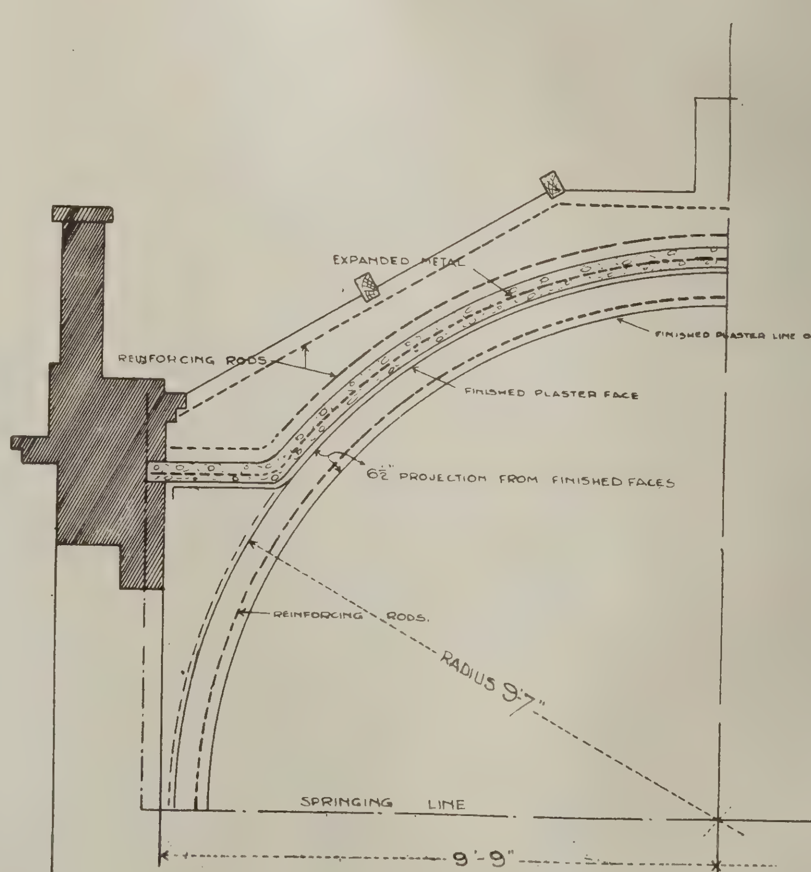


Part Longitudinal Section through Transept.

to eaves 30ft. : there are no abutments of any description, the thrust being all taken up by the reinforcement, which in this case consists of expanded metal and round rods. Every 10ft. or so along the barrel of the arch are projecting bands, 9ins. deep, with sinkings for plastering: between each rib or band there are oval sinkings or panels 3 ins. deep. Over each window there are relieving arches intercepting the main barrel vault. The roof over the sanctuary consists of a saucer dome 20ft. in diameter, supported on two sides by a barrel vault forming the entrance to the nave and transept. On the other sides are large relieving arches over the main windows. The transept roof is constructed on a similar design to that of the nave, being a barrel vault with projecting ribs and intercepting arches over the windows; the span in this case, however, is 20ft. In each roof upstanding ribs are carried up from the springing of the arch to the apex of the roof, forming rafters for the longitudinal timber purlins, the roof between them being finished with ordinary battens and slates.

The accompanying illustrations show the finished barrel roof over the nave, and the saucer dome over the sanctuary, together with sections and a plan of the building.

ERRATA.—The following errors occurred in the article by Mr. Alan A. Fletcher, M.S.E., entitled "Concentrated Loads on Joists," published on page 192 of our issue for February 26th last:—The third line of the first column on page 193: "flange thicknesses—2$\frac{1}{6}$th of web" should read "flange thickness + 2.$\frac{1}{6}$ of web." The seventh line: "2 = 8 in.—(2 × 1 × 2 $\frac{1}{6}$. 8)—4 in." should read A = 8 in. (2 × 1 + 2.$\frac{1}{6}$. 6) = 4 in.



Part Cross-section through Transept.

REINFORCED CONCRETE BARREL VAULTS AT ST. CHARLES'S COLLEGE CHAPEL, NOTTING HILL, LONDON.

Centering of Saucer Dome.

[Photo: Campbell-Gray, Ltd.

View of Saucer Dome from Below.

Barrel Vault Complete.

ST. CHARLES'S COLLEGE CHAPEL, NOTTING HILL, LONDON, W.

A LATTICE REINFORCEMENT.

On the next page we illustrate two examples of the use of Johnson's Wire Lattice for the reinforcement of concrete floors. One illustration shows how the lattice is used in a floor being laid on the joists and allowed to sag down at the centre. The other illustration shows an interesting application of the same lattice reinforcement to the construction of the concrete floor of one of the bridges over the ornamental waters in Regent's Park, London, N.W. Several other similar bridges over these waters and over the Regent's Canal have had the former decking replaced by concrete reinforced with Johnson's Wire Lattice.

FIRE-RESISTING FLOORS.

We have received from the United Kingdom Fire Proofing Co., Ltd., of 47, Victoria Street, London, S.W., a copy of a well-got-up sheet of coloured lithographic reproductions of drawings of fire-resisting floors of various designs, which this company is issuing to architects. The drawings should be valued, as they show the details of each type of floor very clearly. The firm state that they endeavour to provide a floor to meet any special requirements of an architect or engineer, and not to try and make them believe that one particular system is much superior to all others. Several of the types of floors shown are constructed without centering and are light, sound-proof and fire-resisting, having hollow tubes placed between beams with a top filling of concrete, the last alone being done *in situ*. The hollows of the tubes can be utilised for ventilation and other purposes, though their chief purpose is to render the floor soundproof, and to give a level soffit.

CHANGE OF ADDRESS.—Messrs. The Considère Construction Co., Ltd., have moved their offices from No. 3 to No. 5, Victoria Street, Westminster. Telephone: No. 3033, Victoria, Telegrams, "Spiralette, London."

REINFORCED CONCRETE RAILWAY SLEEPERS.—The Italian State Railways, after experiments, have decided to employ sleepers of reinforced concrete on their lines, and a first lot of 300,000 of such sleepers, at the cost of 6s. 4d. each, has been ordered from five different Italian firms. The sleepers are to be delivered during the present financial year.

A NEW MANCHESTER BUILDING.—On the site of the Royal Hotel, at the corner of Market Street and Mosley Street, Manchester, a block of shops and offices is to be erected from designs by Messrs. J. W. Beaumont and Sons, architects, of Manchester. The demolition of the old building is now being undertaken and the new building will probably be commenced in July next.

A CATALOGUE OF THE CHIEF PERIODICAL PUBLICATIONS OF THE WORLD has been compiled by Professor Emile Guarini, of the Ecole d'Arts et Métiers, at Lima, and is now published (price 3 francs) by H. Dunod and E. Pinat, 49, Quai des Grands-Augustins, Paris. The list comprises 4,063 publications, classified in countries and sections, with the address, price, date of issue, etc., of each.

JOHNSON'S LATTICE-CONCRETE FLOORS IN COURSE OF CONSTRUCTION AT TRANSVAAL UNIVERSITY COLLEGE, JOHANNESBURG.

A BRIDGE OVER THE ORNAMENTAL WATERS IN REGENT'S PARK, LONDON, N.W. ; CONCRETE DECK REINFORCED WITH JOHNSON'S WIRE LATTICE.

(*For particulars see preceding page.*)

A FLOOR TEST.

An official test was recently conducted on the reinforced concrete floors of the Postal Telegraph Stores at Adderley Park, Birmingham, which have just been erected by the Cubitt Concrete Construction Company, to the general designs of Mr. J. Rutherford, architect to H.M. Office of Works. The designs for the reinforced concrete construction were prepared by the Trussed Concrete Steel Co., Ltd., and checked by Mr. William Dunn, F.R.I.B.A., consulting expert on reinforced concrete to H.M. Office of Works.

The building consists of four floors and roof, with a total length of 205ft. and a width of 60ft. 6ins., the height of the structure being 60ft. The entire skeleton of the building, namely, the columns, beams, decking, and so forth, is erected in reinforced concrete. The facing is of brick and stonework, carried at each floor level on reinforced concrete beams. In this way, the wall is practically erected in panels, and is entirely carried by the framework. The walls do not carry any of the floor loads.

The ground floor was designed for a superimposed load of 560lbs. per foot super., the first and second floors for 325lbs., and the third floor for 225lbs. per ft. super. The decking of the ground floor is 5ins. thick, reinforced with $\frac{1}{2}$in. Kahn trussed bars. The main beams, of 23ft. 3ins. span, are 21ins. wide, reinforced with $1\frac{1}{4}$in. Kahn trussed bars. The design of the floors is shown by the accompanying illustration. The reinforcement for the columns consisted also of Kahn trussed bars.

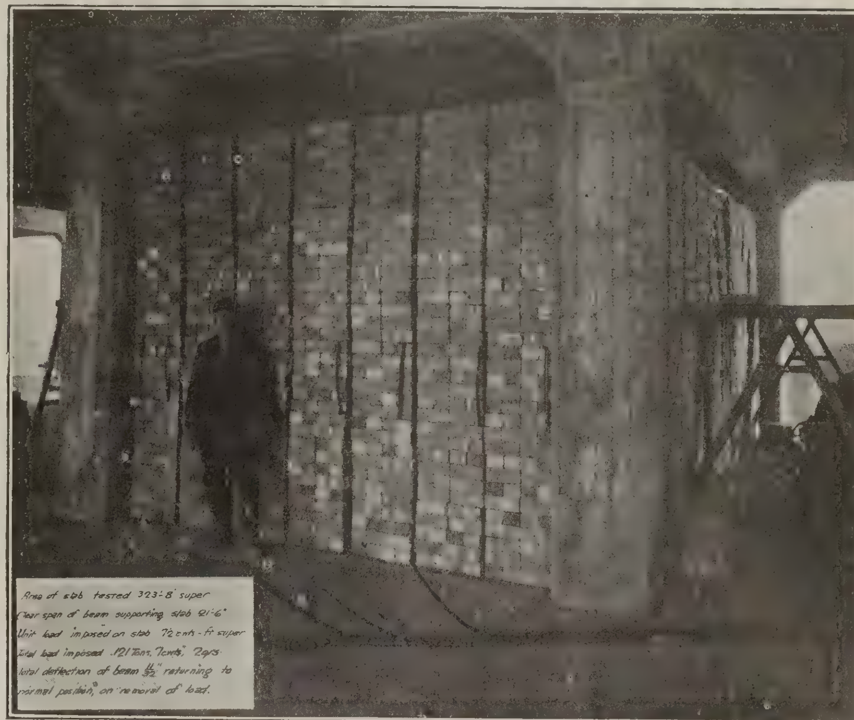
An official test of the floors took place on February 7th. It was carried out on an area of 323ft. 8ins. super., extending over three beams. On February 5th the floor was loaded up to $2\frac{1}{2}$cwts. per ft. super., remaining under this load until February 7th, when the deflection indicators were fixed. The specified load of $5\frac{1}{2}$cwts. per sq. ft. was then applied. The deflection recorded was exactly $\frac{1}{8}$in., which had increased in three hours to $\frac{5}{32}$in. An additional load of $2\frac{1}{2}$cwts., making a total of $7\frac{1}{2}$cwts. per ft. super., was then applied, and caused a deflection of $\frac{1}{4}$in., which did not increase in one hour. On a 23ft. span the allowable deflection, according to specification, would have been $\frac{1}{2}$in. under the test load.

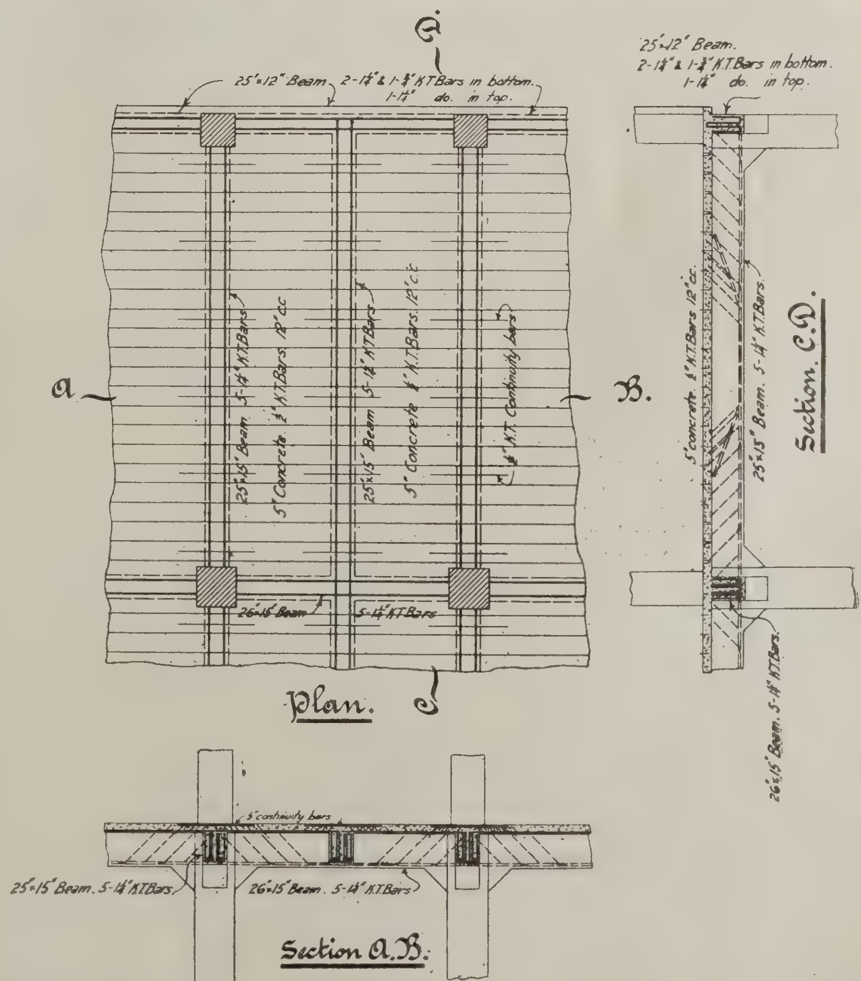
Instructions were given to remove the extra load of $2\frac{1}{2}$cwts., when the deflection decreased to $\frac{7}{32}$in. The remaining load of 5cwts. per ft. super. was kept on until the following morning, when the deflection indicator read the same as on the previous night.

On clearing the floor it regained its normal position.

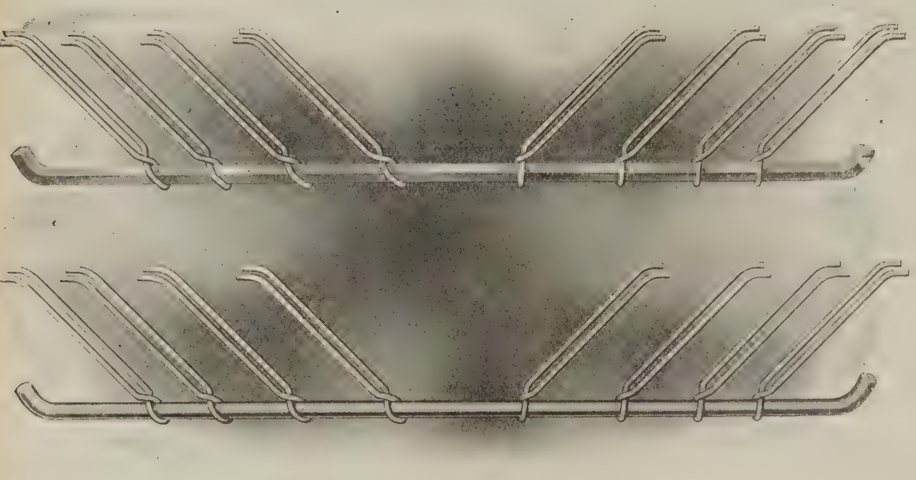
In this test the brick was piled up in one solid mass, and the architects, being of opinion that arch action might have taken place, decided to have another test made on the floors with the same loading, this time piling the bricks in independent stacks, so as to prevent arch action. A photograph of this loading is here shown. The second test was made on February 13th over the same area, when the floor was loaded up to $2\frac{1}{2}$cwts. per ft. super., and remained under such load for six hours, at which time the deflection indicators were fixed, and registered no deflection. Half-an-hour later the load was increased to $3\frac{3}{4}$cwts. per ft. super., and the deflection was $\frac{1}{16}$in. This loading was maintained for fifteen hours, when the reading of the indicator showed a deflection of $\frac{3}{32}$in. Eight hours later, the deflection remaining constant, the load was increased to $7\frac{1}{2}$ cwts. per ft. super. at which time the deflection measured $\frac{5}{16}$in. On February 15th the load was reduced to 5cwts., when the deflection registered was normal, and on February 16th, the load having been removed, the floors regained their normal position.

We understand that both these tests were considered highly satisfactory by the Office of Works.





REINFORCED CONCRETE FLOOR SLAB (KAHN SYSTEM) TESTED AT NEW TELEGRAPH STORES, BIRMINGHAM, FOR H.M. OFFICE OF WORKS, FEBRUARY 5TH, 1908.



REINFORCEMENT USED IN THE SYSTEM OF THE BRITISH REINFORCED CONCRETE ENGINEERING CO.

THE BRITISH REINFORCED CONCRETE ENGINEERING CO.

We understand that an influential syndicate has been formed to take over the business and to work the system of reinforced concrete hitherto carried on by the British Reinforced Concrete Engineering Co., of 196, Deansgate, Manchester.

This system has been adopted in several important buildings. For members built to resist loads under compression, there are two systems of hooping. In one, single hoops are used, which, by a simple arrangement, also secure the bars in their exact position. The other is a system of sectionised helical winding, which also bonds through the structure. The units for beams, floors, etc., subject to bending, consist of trussed bars (an illustration of which we reproduce), the stirrups being preferably made from round rods—although flat, up to ⅝in. by 3-16th in., have been made. These stirrups are turned out cheaply by machinery, and fit completely around the main bars—which may be of round, square, angular, or any ordinary section—to which they grip in such a manner as to prevent slip. Ramming the concrete slightly spreads the arms apart and tightens the grip of the stirrup to the bar, securely anchoring it to the concrete. A positive truss can thus be formed with also a true mechanical bond. The parts are adjustable to any degree, can be made to any length, and any number can be used per bar. Buildings erected on this system at Birkenhead, Glasgow, Gourock, Paisley, Warrington, etc., have proved to be highly satisfactory. The whole, being from commercial steel, allows of great economy. Particulars can be had from the above address.

Obituary.

MR. G. E. WAREHAM HARRY, borough surveyor, of Cambridge, died on March 13th.

MR. W. O. CALLENDER, founder of the firm which is now the Val de Travers Asphalte Co., Ltd., and of Messrs. Callenders' Cable and Construction Co., Ltd., died recently at Bournemouth, in his 81st year. He was a pioneer in the development of asphalt for roadways, having, in the 'sixties, laid the first roadway of that kind in London — in Threadneedle Street; and later he showed a similar foresight in the application of bitumen for sheeting, cable covering, and other purposes.

MR. S. P. REES, A.R.I.B.A., of London, E.C., died recently. He was associated with many well-known architects, having been with Mr. William H. White Mr. T. G. Jackson, R.A., and later in H.M. Office of Works.

MR. JOHN LESLIE died on Wednesday last, at his residence, the Cottage, Knowsley, Liverpool. Mr. Leslie, who was 82 years of age, was for 35 years architect and surveyor to the Earl of Derby on his estates. His professional education was received in the office of Sir Charles Barry, the architect of the Houses of Parliament. He designed and carried out large building operations on Lord Derby's estates in Lancashire, Kent, Middlesex, and at Newmarket, and also extensive alterations and additions to Knowsley Hall. Witherslack Hall, and Derby House, London. Mr. Leslie was actively engaged in his duties to the last, being at his office apparently in his customary health on Wednesday. During the night. however, he was seized with illness, and his end came suddenly.

LONDON COUNTY HALL DESIGNS BY SCOTTISH ARCHITECTS TO BE EXHIBITED IN EDINBURGH.—Arrangements are being made to exhibit at the Royal Scottish Academy at Edinburgh the four designs submitted by the Scottish architects—Mr. Hippolyte J. Blanc, Mr. G. Washington Browne, Messrs. A. Marshall, Mackenzie and Son, and Messrs. Houston and Horn —in the final competition for the London County Hall.

THE "EDWARDIAN" CHIMNEY POT.—Messrs. Joseph and Smithem, architects, have decided to use Messrs. Mark Fawcett and Co.'s new down-draught preventing chimney pot—the "Edwardian"—for the block of artisans' dwellings now being erected in James Street, Bethnal Green. Quite 400 pots will be needed. It is interesting to note that these pots, which have been adopted for Windsor Castle and many other important public buildings, can be turned out cheaply enough to be included in the necessarily economical scheme for artisans' dwellings.

Coming Events.

Wednesday, March 25.

ARCHITECTURAL ASSOCIATION (Discussion Section).—Mr. Arch. J. Nicholson, on "Stained Glass," at 7.30 p.m.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Mr. F. Gordon Brown on "Dalmatia," at 8 p.m.

INSTITUTION OF CIVIL ENGINEERS.—Students' Visit to the Works of the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., at Silvertown, E.

SOCIETY OF ARTS.—Mr. A. S. Jennings, on "Recent Improvements in Decorators' Materials," at 8 p.m.

BOROUGH POLYTECHNIC.—Mr. Alfred Bedding, on "Some Old London Churches," at 8.15 p.m.

Thursday, March 26.

LEEDS AND YORKSHIRE ARCHITECTURAL SOCIETY.—Mr. Percy S. Worthington, M.A., F.R.I.B.A., on "Phillipo Brunelleschi and his Work in Florence," at 6.30 p.m.

ROYAL INSTITUTION.—Mr. R. T. Glazebrook, M.A., D.Sc., on "Standardisation in Various Aspects—II., Electrical Engineering," at 3 p.m.

Friday, March 27.

BIRMINGHAM ARCHITECTURAL ASSOCIATION.—Mr. G. Salway Nicol, A.R.I.B.A., on "The B.A.A. Excursion to Picardy."

GLASGOW TECHNICAL COLLEGE ARCHITECTURAL CRAFTSMEN'S SOCIETY.—Mr. Alex. W. R. Bell on "Good and Bad Practice in Buildings."

Saturday, March 28.

SOCIETY OF ARCHITECTS.—Visit to the Swanscombe works of the Associated Portland Cement Manufacturers (1900), Ltd.

Monday, March 30.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.—Mr. George Hubbard, F.S.A., F.R.I.B.A., on "The Cathedral Churches of Cefalo," at 8 p.m.

SURVEYORS' INSTITUTION.—Mr. F. C. Hunt, F.S.I., on "Quantities: Should they form part of the Contract?" at 8 p.m.

NEXT MONTH'S MEETINGS.

Wednesday, April 1.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Mr. Gordon L. Wright on "The Education of the Architect," at 8 p.m. (Associates' Paper.)

INSTITUTE OF SANITARY ENGINEERS.—Paper by Mr. G. B. Hartfree, at 8 p.m.

Friday, April 3.

ARCHITECTURAL ASSOCIATION.—Mr. Lewis F. Day, on "Originality and Tradition in Design," at 7.30 p.m.

GLASGOW TECHNICAL COLLEGE ARCHITECTURAL CRAFTSMEN'S SOCIETY.—Business Meeting.

Monday, April 6.

LIVERPOOL ARCHITECTURAL SOCIETY.—Annual General Meeting.

L.C.C. SCHOOL OF BUILDING (Ferndale Road, Clapham).—Prof. Beresford Pite, F.R.I.B.A., on "Ornamental Leadwork," at 7.30 p.m.

SURVEYORS' INSTITUTION.—Mock Judge and Jury Compensation Case, at 7 p.m. (Junior Meeting).

Wednesday, April 8.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Associates' Business Meeting, at 8 p.m.

GLASGOW INSTITUTE OF ARCHITECTS.—Mr. George L. Allen, M.I.M.E., on "Roof Coverings."

INSTITUTION OF MECHANICAL ENGINEERS.—Anniversary Dinner.

ARCHITECTURAL ASSOCIATION (Discussion Section).—Paper (to be announced), at 7.30 p.m.

Thursday, April 9.

SHEFFIELD SOCIETY OF ARCHITECTS AND SURVEYORS.—Annual General Meeting.

Saturday, April 11.

INSTITUTE OF SANITARY ENGINEERS.—Visit to East London District Waterworks, Lea Bridge.

Monday, April 13.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.—Mr. H. Heathcote Statham, F.R.I.B.A., on "A Threefold Aspect of Architecture: Tradition—Character—Idealism," at 8 p.m.

Wednesday, April 15.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Annual Business Meeting; President's Valedictory Address, at 8 p.m.

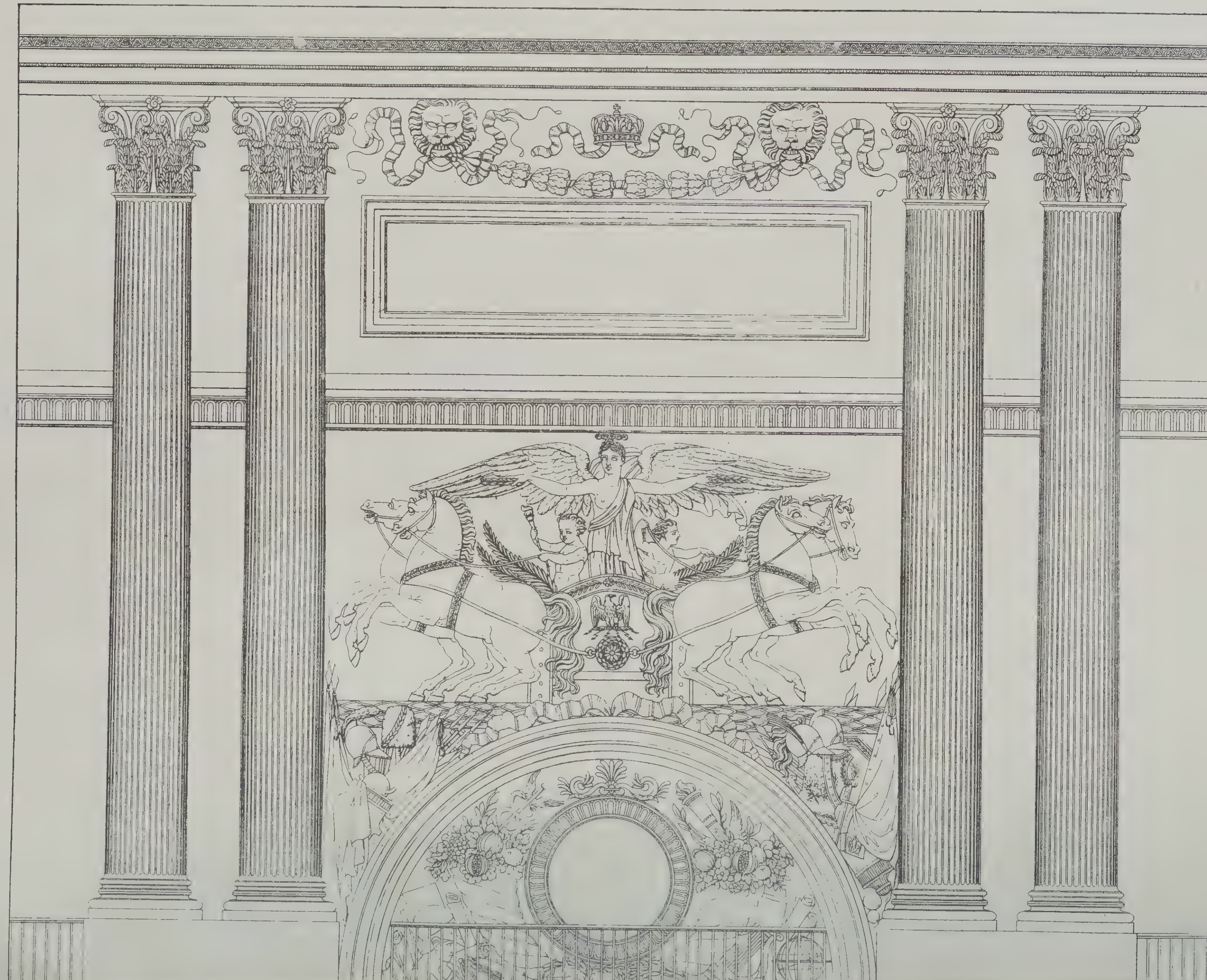
MANCHESTER SOCIETY OF ARCHITECTS.—Social.

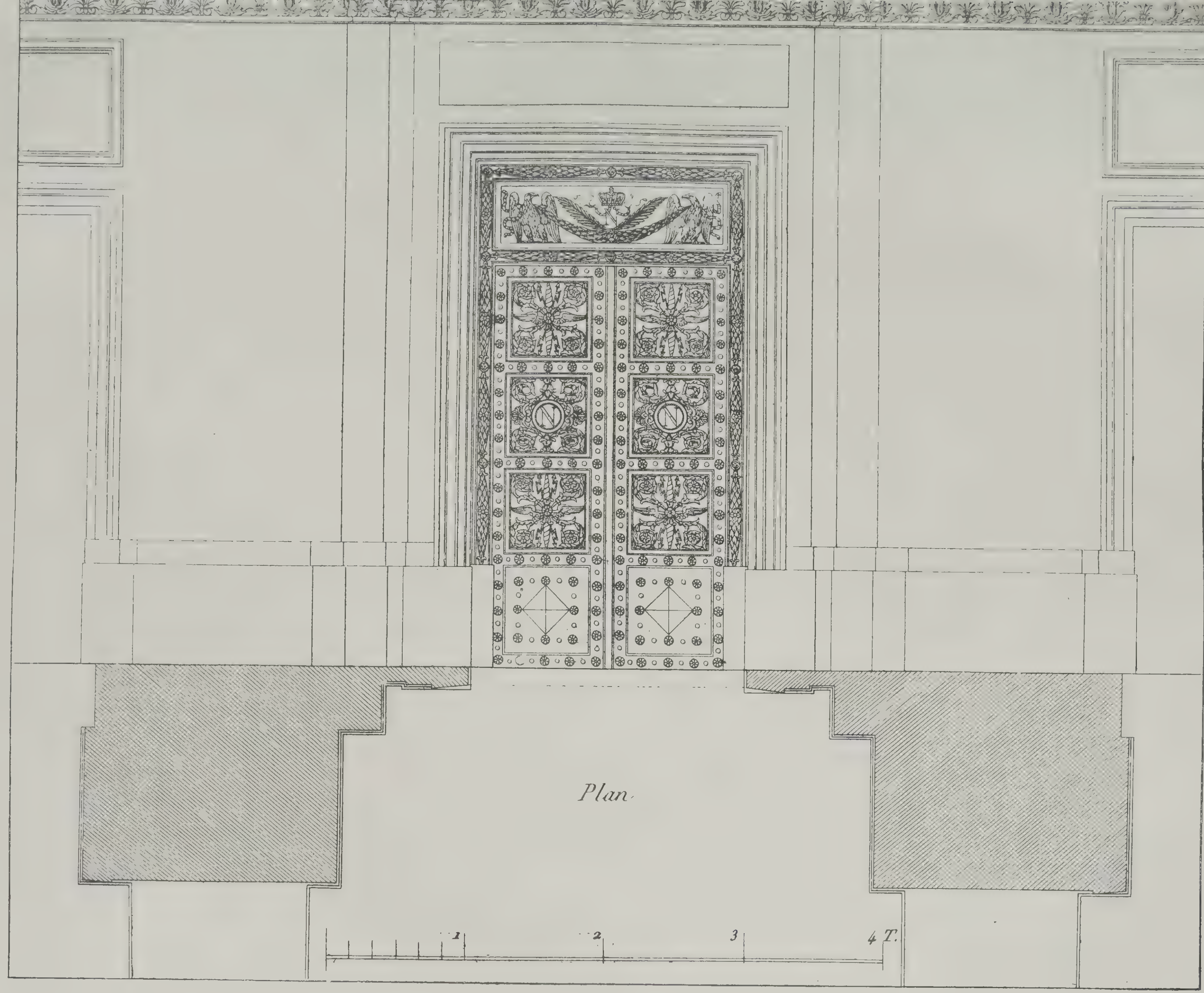
Saturday, April 18.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Visits to Lady Stair's House and Trinity College, Jeffrey Street.

Monday, April 27.

SURVEYORS' INSTITUTION.—Paper on "The Modern Education of a Land Agent," at 4 p.m.





DETAIL OF MAIN ENTRANCE TO THE LOUVRE, PARIS. FONTAINE AND PERCIER, ARCHITECTS.

April 1, 1908. Volume 27 No. 686.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

The Assessor once more. Having received a letter under this heading from an anonymous correspondent, we take occasion to make a few remarks on the subject. Our columns are always open for the free discussion of all subjects connected with the welfare of the architectural profession and we are desirous of giving publicity to the legitimate grievances of its members, but we must again emphasise the fact that all letters on controversial questions *must* be accompanied by the author's name and address, even if it be desirable to preserve the correspondent's anonymity in our "Correspondence" columns. The letter to which we refer throws doubt upon the wisdom of the choice made by the president of the Royal Institute of British Architects in the nomination of gentlemen to act as assessors in two recent competitions for school buildings, on the ground that neither of the architects (thus selected for a position of great responsibility) has *specialised* in the type of work for which his services are now requisitioned. Our anonymous correspondent also mentions two recent cases of bad awards made by one and the same assessor, who, however, was not, in either case appointed by the president—the first miscarriage of justice occurring in the case of a competition for a large infirmary, and the second in that for some public baths proposed to be erected in a northern town. While as a matter of fact we know that in one, at least, of the cases cited there are good grounds for complaint, yet for the reason stated we regret we are unable to do more than give a general indication of our correspondent's views.

The Jury System of Assessing Competitions. In a letter to the editor of the "Journal" of the Royal Institute of British Architects, Mr. A. R. Jemmett raises the question whether the system, occasionally adopted in this country, of appointing three or more architects to consult with each other and adjudicate upon competitive designs can correctly be described as the jury system. As we understand it, Mr. Jemmett's point is that in countries in which it is customary to allow architectural competitions to be judged by three or more assessors, the mode of procedure is as follows:—Each member of the jury has a certain number of votes allotted to him, which he apportions between various designs; thus design A may receive five votes for its architectural treatment, and no vote at all for its planning; while design B may obtain three votes for its architecture and two for its planning; and design C no vote for either. The aggregates of the votes thus given, independently and under several heads, are then tabulated and compared, and the numerically weaker designs eliminated from the contest. This process of voting is repeated with the remainder until only one design is left, which Mr. Jemmett asserts "comes to the front automatically without its being necessarily the one which appeals most strongly to the personal taste of any member of the jury."

The Transportation of Crosby Hall. The proposal to transport Crosby Hall to Chelsea, and to incorporate it with the More House University Hall building, is assuming definite form. At a recent private meeting held by the supporters of the scheme, Professor Geddes explained the two essentials necessary for its success. These appear to be: (1) The consent of the bank directors to the re-erection of the building at Chelsea; and (2) the approval and support of London University. Professor Geddes thinks that the amount required for the re-erection of Crosby Hall (about £10,000) could be raised without much difficulty. The supporters of the scheme point out that their proposal would admit of the preservation of the internal quadrangle, and, consequently, would enable the hall to be seen to the best advantage, and while being thus freely accessible to the general public it would form, in connection with the buildings of More House, a nucleus for University life in London, a museum for relics of More's life and times, a suitable place for the delivery of University Extension lectures, and a gallery for exhibitions connected with the artistic life of Chelsea. We presume that every precaution has been taken to enable the component parts of the demolished structure to be put together and re-erected without recourse to the use of an undue proportion of new materials and if this is the case it appears to us that the historic building, which is said to be closely connected with More's earlier career, would find an appropriate resting-place in the neighbourhood of his later abode. Erasmus, the Lord Chancellor's friend, has drawn a charming picture of the latter's household life in the "modest yet commodious mansion" that Sir Thomas More built for himself at Chelsea, which was famous, years after his tragic death, as the favourite residence of one of the most illustrious Englishmen of his century.

Brunelleschi's Work in Florence. Mr. Percy S. Worthington, M.A., F.R.I.B.A., read a paper on "Phillip Brunelleschi and his work in Florence" before last Thursday's meeting of the Leeds and Yorkshire Architectural Society. The lecturer remarked that Brunelleschi was one of the most interesting personalities in the history of art. Beginning as a sculptor, and disappointed in the great competition for the Baptistry gates (the result of which was to couple him as equal in merit with Ghiberti) he threw over sculpture and determined to become an architect. He went to Rome with Donatello and studied the remains of classical Rome with great diligence. It was the excitement caused in Florence by the project of building the dome over the still open central space of the Cathedral which brought him back to Florence. His model for the dome, after much opposition, was finally accepted. The building of the dome was commenced in 1407 and was completed in 1431, seven years after the architect's death, by Andrea Verrochio's ball at the summit. Thus Brunelleschi did not see his great work finished, nor had he a better fate with regard to his smaller works, for, of all his buildings, not more than one was completely finished during his lifetime—the Pazzi Chapel in the Santo Croce. One other building he saw completed in itself, the old Sacristy of San Lorenzo, but this was afterwards spoiled by his best friend Donatello. So Brunelleschi could not be considered to have been a successful man during his lifetime, but he had had more influence upon architectural history than any other architect, and that he did not see more proof of this was largely due to the fact that a considerable portion of his long life had gone by before he finished his architectural education. He was the first architect in the modern sense of the word, and established his control over the building brotherhood (whose guild he never joined) with great firmness and determination. San Spirito may be considered his greatest and finest conception of a completed building. Of his smaller work the Pazzi Chapel and the Church of the Badia di Fiesole are undoubtedly of the greatest importance and interest. Purists will find little to criticise in the latter, but the Pazzi Chapel has come in for stinging assaults by critics whose

pedantic appreciation of correctness seems to prevent their seeing the real living charm of the work and the extreme originality of many of its parts.

The Architect's Delinquencies in regard to Cupboards. We take the following from an article that appeared in the "Daily Express" recently, under the heading of "Woman versus Architect":—"The simple statement that Old Mother Hubbard went to her cupboard is one to stir the modern Englishwoman's heart to envy. The cupboard may have been bare, but at all events she had one. In the good old days, before English architects had lost all human sympathy, there were nooks, ingles, angles, cupboards galore, cellars, and attics. . . . We can do without attics or cellars, sell off things when we have done with them, and embrace temperance; but, deprived altogether of cupboards, the worm turns. The English architects of the hour have gone too far. Why do they do it? Have any architects ever married? Or, if so, have none of them had children? Have they never owned bicycles, or tennis or croquet sets, or hockey or golf sticks, or fishing tackle? Has no one told them that it is possible to accumulate golf-boots, skates, leggings, motor-coats, rugs, foot-warmers, goggles, caps, and cushions? Do no architects realise that quite modest people may own a few thousand books, including albums, scrap-books, and other bulky sorts? Did none of them ever collect photographs or sheet-music, or scores of operas? . . . .It would indeed be a happier, cheaper, and much more comfortable England if architects could be forced by law to take degrees in utility and common-sense. Fancy the comfort of living in a house built by John Smith, L.T.U.H.C. (Looks to Utility and Has Common-sense). It is too good to be true."

The Government's Town Planning Bill. The Government's Housing and Town-Planning Bill, which was issued last Saturday, is emphatically a strong measure, reflecting much of the characteristic aggressiveness of its sponsor, Mr. John Burns. Part I. of this Bill extends the operation of Part III. of the Housing of the Working Classes Act to every district, rural and urban, of England and Scotland, but excluding Ireland, and makes compulsory the adoption of that section of the Act specified. The new Bill invests local authorities with compulsory powers for acquiring land for the erection of working-class dwellings, gives authority to enter, after twenty-four hours' notice, any premises for the purpose of examining, surveying, or valuing, and, above all, it greatly magnifies the functions and powers of the Local Government Board. Thus far the Bill, except for its conversion of the Local Government Board into a sort of dictatorial junto, merely intensifies existing means for the betterment of working-class dwellings. Part II., however, introduces the Continental practice of investing a central authority with plenary powers of control with respect to town-planning. The Local Government Board may authorise, and may even compel, a local authority to adopt a town-planning scheme; or, where the local authority is shown to be dilatory or contumacious, the Local Government Board may insist on the preparation and execution of a scheme. The local authority is empowered to deal promptly with private obstruction, and may pull down or alter any building that contravenes an approved scheme, and may itself execute any works that are unduly delayed. Broadly speaking, Part I. runs mainly on humanitarian and sanitary lines, while Part II. aims at a combination of salubrity and convenience. Centrally-controlled planning should prevent the growth of congested areas; and the implied insistence on spacious and direct-route thoroughfares should have the general effect of improving the class and character of the buildings.

New Water Charges. In place of the varying scale of charges made by the water companies of London when they were separate undertakings, there comes into operation to-day a uniform scale for the whole of the vast area controlled by the Metropolitan Water Board. The new tariff puts an end to all anomalies, and reduces extras to a minimum. Ratable value will henceforth be the basis of charge, and there will be a uniform rate of charge of 5 per cent., whatever the size or value of the property may be. The only departure from uniformity under this head is that a rebate of 20 per cent. will be allowed in respect of any house or building used solely for the purposes of trade, business or profession, and occupied as a separate tenement assessed to the poor rate at a sum exceeding £300 per annum, and not charged with inhabited house duty. For domestic purposes there are no extras whatever, unless one regards a bath of more than 80 gallons capacity as a domestic appliance. Water-closets and ordinary baths are no more to be regarded as if they were luxuries and charged for accordingly. A scale of charges has been fixed for water taken for non-domestic purposes. Where gardens are watered by means of any outside tap, or any hose, tube or pipe, there will be a charge of 10s. per season if the ratable value of the property does not exceed £50, 15s. where it does not exceed £100, and 20s. where it does not exceed £200. Water for industrial purposes, taken by meter, comes under the "trade scale," which ranges from 11d. per 1,000 gallons for a supply not exceeding 50,000 gallons per quarter to 6½d. for a supply exceeding 5,000,000 gallons per quarter.

Extent of Indemnity by a Contractor. The Court of Appeal had before them on March 17th a case where the Croydon Rural District Council, as highway authority, sued the Sutton District Water Company for damage caused to a highway called How Green by hauling thereon certain materials to be used in the construction of their waterworks. The defendants, in their turn, relied upon an indemnity given to them by the contractor, J. A. Ewart, to whom they had committed the work, and whom they brought in as a third party. The appeal was from a decision of the Divisional Court confirming a decision of Judge Russell, to the effect that damage caused to the highway by hauling material thereon was not within the indemnity, but only damage caused by the works themselves. The indemnity was contained in clause 6 of the general conditions in the specification, and included the following not unusual terms: "The essence of the contract is that the contractor shall be absolutely and solely responsible for injury or damage to person and property of any description whatever which may be caused by or result from the execution of the works, whether these may have been carried out skilfully and strictly and carefully, and strictly in accordance with the terms of the specification or not." Firstly, the Court dismissed the point taken that the word "property" could not include the interest of the plaintiffs in the highway, and referred to section 3 of the Highways Act, 1878 (41, 42 V., c. 77). As to whether the damage in question was within the words "caused by or result from the execution of the works," the Court expressed very great doubt and difficulty. Other clauses in which the word "works" occurred were referred to, particularly clause 3, which ran as follows: "The contract . . includes the supply of all materials, labour, scaffolding, tackle, and everything necessary for the proper completion of the work"; but their lordships thought that the word "works" was used in different senses in different clauses, and that on the whole the indemnity could not be held to include the damage in question. In dismissing the appeal Lord Justice Farwell suggested that, in future, indemnity clauses should be more carefully framed.

The Drury Lane Theatre Fire. The recent fire at what is, in all probability, the most famous theatre in the world, although of an alarming and damaging character, was fortunately confined to the stage and store rooms of the vast building. The fire-curtain appears to have completely justified its name, and it is satisfactory to be able to record that, notwithstanding the fierceness of the flames, the conflagration did not spread to the auditorium of the theatre. In this connection it is interesting to quote a letter which Mr. J. B. Mulholland, vice-president of the Theatre Managers' Association writes to correct the statement in the press that theatrical managers opposed the introduction of the fire-curtain. "On the contrary," he says, "the great majority of managers willingly adopted the idea. I had an iron-framed fire-resisting curtain fitted to the proscenium of my theatre in Nottingham in 1888—a year before the London County Council came into existence. Furthermore, I find that the Press credits the L.C.C. with the idea of the light roof over the stage, which, by collapsing early in the course of a fire, forms a natural outlet for the flames and smoke. Their first regulation, however, provided for a heavy concrete roof. Such a roof was accordingly erected at the Grand Theatre, Islington, with the result that when a fire afterwards occurred there the flames were driven into the auditorium and the whole theatre was gutted. Then, and only then, did the Council adopt the light roof regulation."

Former Fires at Drury Lane. Originally a cock-pit, Drury Lane was converted into a theatre in Shakespeare's time, and was destroyed by a Puritan mob a year after the poet's death. After being rebuilt it was known as the Phœnix, until its destruction by fire in 1672, when it was rebuilt by Sir Christopher Wren, and re-opened in 1674. Rebuilt in 1794, the theatre was totally destroyed by fire in 1809, and again rebuilt and re-opened, with a prologue written by Byron, in 1812. Macready's management of the theatre commenced in 1841, his farewell performance taking place a year later.

BRICK, TIMBER & PLASTER IN THE EASTERN COUNTIES.*

By Edwin Gunn, A.R.I.B.A.

In those uncorrupted times when the satisfaction of every simple need of life could be safely left in the hands of village craftsmen, the smaller buildings of any populous district infallibly possessed that suitability of character for which we, in our day, must consciously struggle. The vernacular building of the eastern counties does not perhaps exhibit the strongly-marked characteristics shown in work of similar class in certain districts more favoured by nature. Local material is not so obviously ready to hand as, for instance, the excellent stone of the Cotswolds, or the brick and tile of Kent and Sussex. Throughout East Anglia there is an almost total absence of any stone suitable for building purposes. During the Middle Ages, indeed, a deposit of a conglomerate substance known as "pudding-stone" was discovered and worked, but its use did not long continue, either owing to the exhaustion of the quarries or dissatisfaction with what was, at best, a poor material. Where water carriage was available, stone for dressings was often imported from France and the Netherlands, but was even then only used in buildings of importance, and almost always with a sparing hand. Chalk and flint could be had in many parts, and the latter was lavishly used in church building, though only occasionally in smaller work, where more tractable material was apparently preferred. Materials for the manufacture of brick and tile could be readily obtained, but their use also was somewhat restricted by the badness of the roads, which made the transit of any heavy material in bulk a serious and difficult matter. There is excellent brickwork in Essex, Suffolk, and Norfolk, where, indeed, the revived use of brick made a very early reappearance, but in most cases previous to the 18th century it is found in buildings of sufficient size and importance to have justified manufacture upon the spot, or in such situations that the bricks could be brought by water. In the smaller buildings its use is restricted by bare necessity, and generally confined to chimney stacks, wall base, or nogging. Tile roofs were frequent, but the builders were obviously more at home in their use of thatch, and displayed none of the dexterity of the Home Counties tilers, whilst tile-hanging is almost unknown.

The Small Domestic Building.

The type of small domestic building most common in the Middle Ages differs hardly at all in its constructive essentials from the half-timbered buildings of the southern counties of England. It has usually a base of brickwork or brick and flint, upon which is erected oak framing composed chiefly of vertical studs, the narrow panels between being filled with clay and straw. Each successive storey overhangs that below, and the panels are plastered flush with the framing. An immense amount of work such as this remains almost intact in such towns as Lavenham, Sudbury, Hadleigh, and in their adjoining villages. It was also a very frequent practice to fill in the panels between the timber framing with brick nogging, laid with most charmingly-ordered irregularity in various forms of diagonal, herring-bone, and checker patterns.

Wherever oak half-timber construction of this form has been usual, its stability and durability have generally proved to be very great. But whilst its structural condition remains good, its external appearance often takes an air of picturesque dilapidation which, though much appreciated by sketchers and photographers, is distasteful to the mind of the owner, who then proceeds to find a remedy. In Kent and Sussex this remedy is generally tile-hanging, but, as before stated, this is uncommon in East Anglia; it is, in fact, in the early 17th century that the specially individual characteristics of the district develop.

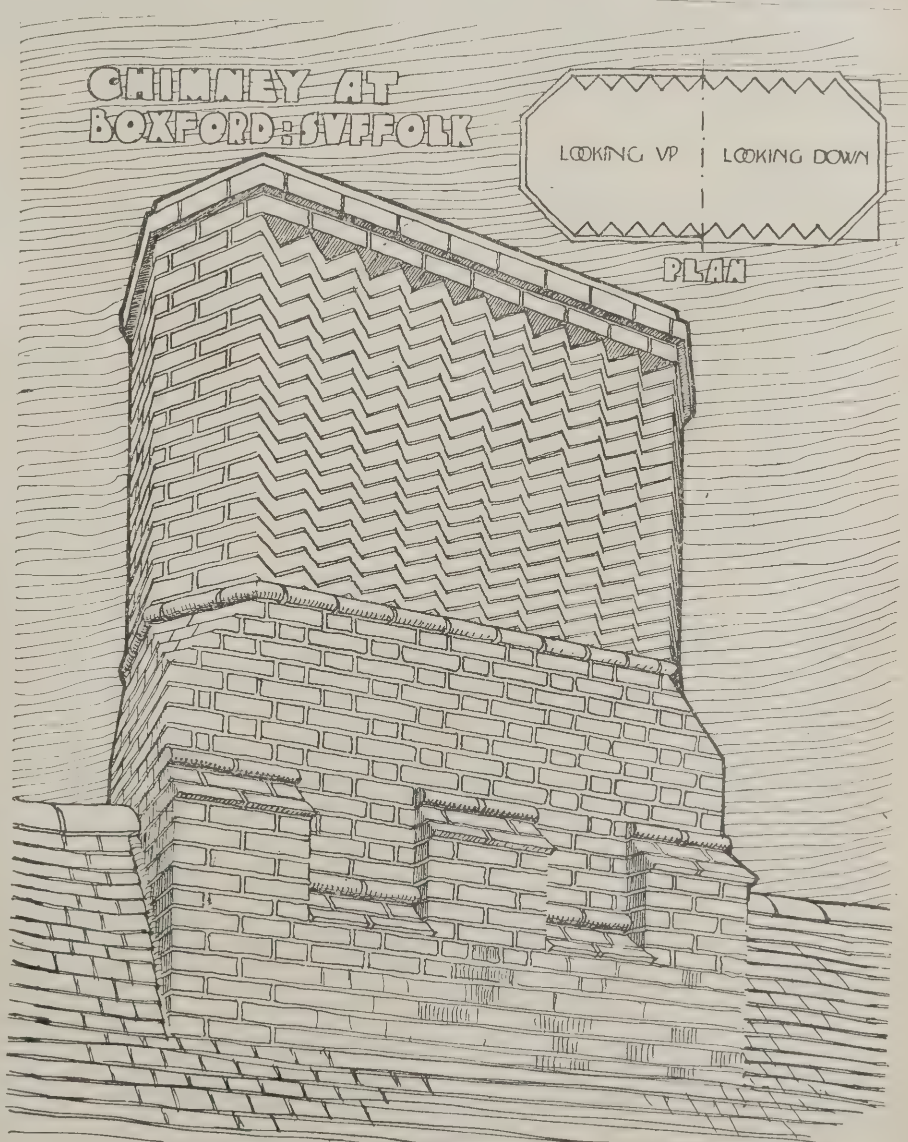
The central area is Suffolk, and in Suffolk the plastered cottage is supreme. In most of the villages and smaller towns may be found whole streets of buildings which, though clothed in simple and charming coats of plaster of later date, will in most cases be found to be structurally of the 15th century. This, in fact, is often the case even when a perfectly flush and featureless front is presented to the street; as, when the timbering was to be covered, it became needless to continue the protection afforded it by the overhanging upper storey, which was accordingly picked up by advancing the ground-floor wall (often at the expense of the footpath) and enlarging the rooms thereby. When in later days this course was followed, the wall was more often entirely rebuilt in brick, leaving the old oak moulded joist floors, which thus occur in buildings of most unpromising appearance. Buildings are often so treated to the present day. Another form of protection often adopted—more particularly in Essex—was weather-boarding. Once these protective coverings were generally in use for old buildings it was, of course, but natural that new buildings should also be erected on the same lines, and at this stage, before proceeding to a more detailed consideration of the plasterwork, I will partly recapitulate with a brief description of the principal types of construction usual in the humble work of the Eastern Counties before easy transit upset all tradition.

I.—Wattle and Daub.

The most primitive type of cottage is apparently that in which the walls are of spars laced with withies, plastered with coatings of clay, and covered with thatched roofs. The roofs in Norfolk are generally of reeds, and elsewhere of rye-straw. This type of cottage, with its whitened walls and dark thatch, is very picturesque, and though it does not now afford a type for present-day imitation, had in rural districts the great advantage that repairs were easy.

II.—Timber Framed Construction with Plaster Panels.

The type of half-timber construction



MEASURED AND DRAWN BY EDWIN GUNN, A.R.I.B.A.

*A paper read before the Architectural Association (Camera and Cycling Club) on March 18th, 1908.

customary in the Eastern Counties has already been described. The only point in which it is at all singular is in the frequently repeated introduction of what I must describe as a sort of glazed frieze immediately beneath the head of each tier of framing. This appears to me an entirely admirable feature. Structurally, it is free from objection, as the strength of the building lies entirely in the studding and is not affected whether the panels are of plaster or glass. Asthetically, the sparkle of the glazing under the deep shadow of the overhanging storey is very charming externally, and the light introduced by these long windows very effectively brightens up the heavy moulded beams of the ceilings, and so entirely prevents that gloomy effect which (with all deference) is often rather in evidence in such buildings.

III.—Timber Framed Construction with Brick Panels.

This type, though in no way peculiar to Suffolk, is there most often found. It has a very mellow colour effect when the oak timbers have been allowed to weather naturally, but is spoilt when they are tarred, and looks then as horribly garish as the Cheshire "magpie" work.

IV.—Timber Framed Construction Plastered Externally.

This is, to me, the most interesting work in East Anglia. As I have already mentioned, many of the houses so treated are old friends in a new guise, but all are equally interesting, and in these days, when one is getting tired of rough-cast and its fatal facility, they are most suggestive as showing a logical method of treating external plasterwork and a simple means of introducing texture into bare surfaces.

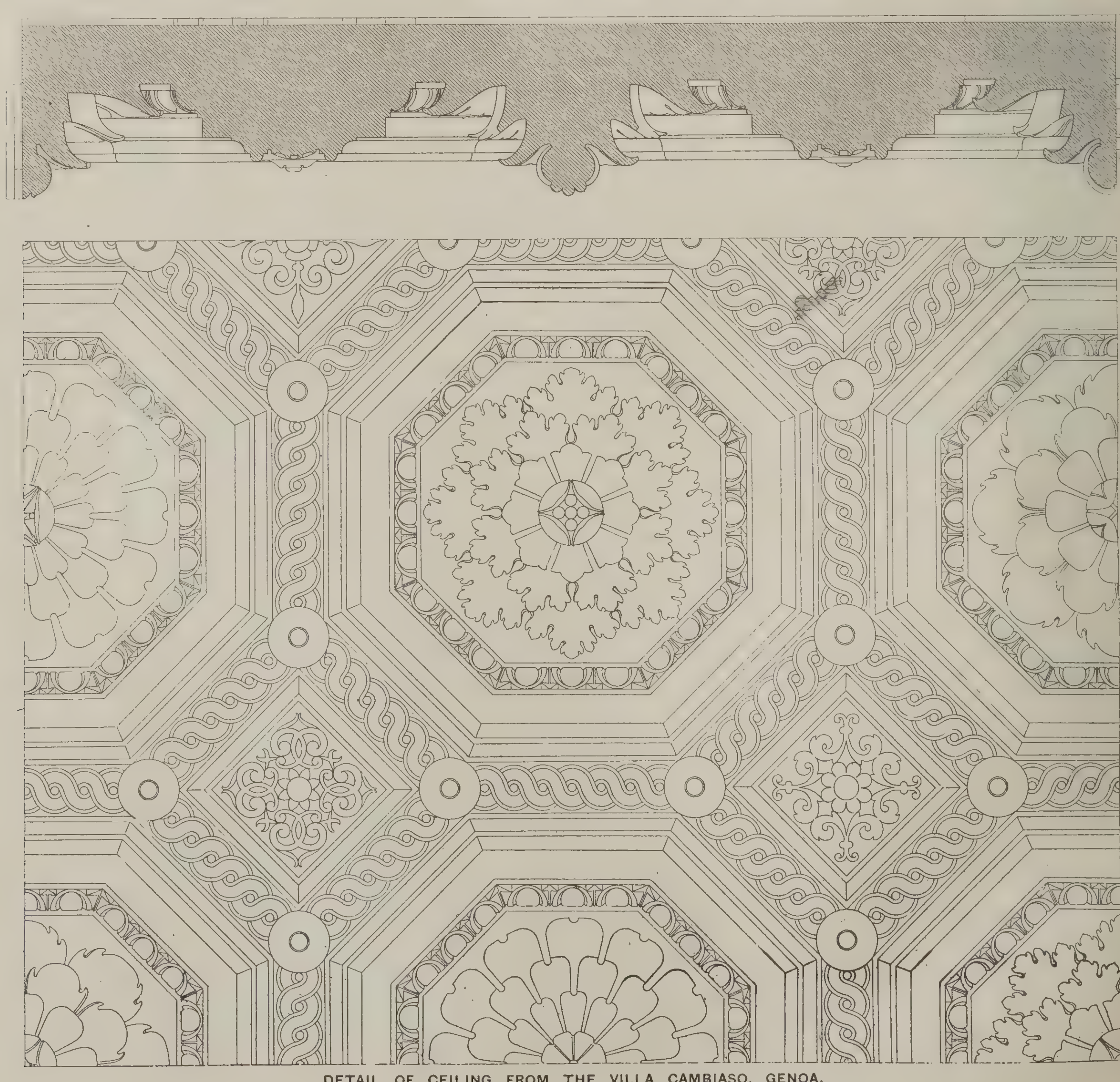
V.—The Weather-Boarded Cottage.

This is also often No. II. or No. III. rehabilitated, but in parts—chiefly south Essex—a good deal of new construction was carried out on these lines, and some of it is quite good. The boarding is usually tarred or painted.

VI.—Brickwork.

Great proficiency in the use of brickwork was attained at a comparatively early date in the Eastern Counties. It is only necessary to instance such examples as Little Wenham Hall, East Barsham Manor House, Oxburgh Hall, Great Snoring Rectory, Layer Marney, and other similar buildings in proof of this. In the smaller buildings, however, it is chiefly in chimney stacks and wall base that brickwork shows. The capacity of the local bricklayer to produce good results with no other material than common red bricks (of course 2ins. thick) and plain tiles was quite surprising. I have been astonished at the variety of design extracted from these simple materials as used in the chimney stacks of the early 17th century. Earlier than this the usual clusters of octagonal shafts, often elaborately moulded, are most frequent, but from that time onward a distinct local type seems to have arisen, and one which appears to have many points in its favour.

Beautiful as all must admit the clustered type of stack to be, the single flues of which it is composed offer the very greatest chance of down-draught, owing to their large cooling surface, and, furthermore, have great opportunities of falling into disrepair. The abundance of examples in which they may be seen to have been rebuilt from the base upward is evidence of this. In the later type detached flues are abandoned; or rather, they appear to coalesce into ribbed chim-



DETAIL OF CEILING FROM THE VILLA CAMBIASO, GENOA.

(Other illustrations of this building were given in our issue for last week.)

The proposed addition consists of hall, living-room and sitting-room, with four bedrooms over, together with bath-room. The materials to be used are loca hammer-dressed wall stones for the lower portion, with brickwork (rough-cast) above, and local stone slabs on roof. The architect is Mr. Percy Turner, A.R.I.B.A., of Bradford.

ney stacks, having a fine sturdy effect and the practical advantage of keeping the flues warm and preserving their own stability.

VII.—Flintwork.

It is unnecessary to expatiate on the beautiful flintwork of the Norfolk and Suffolk churches. Used either undressed as rubble (often plastered), combined with brick and tile, knapped, or very precisely squared, and in various combinations with dressed stonework, it is well known. Except in some parts of Norfolk and Northern Suffolk, however, flintwork in the smaller buildings fulfils the very humble rôle of wall base and gutter paving. It is, of course, admirably suited to this purpose, owing to its absolute immunity from damage by the drippings from gutterless roofs. In those parts where its use is more extended it is necessary to form quoins and reveals of openings with some square material, usually brick. This perhaps is a reason against its more general adoption. There seems always to have been in the Middle Ages a healthy disposition to restrict variety of material as far as possible, and this habit took time to wear off. In some remote and blessed parts it lingers even yet.

Suffolk Plasterwork.

The material used in Suffolk plasterwork consists merely of lime, sand, and hair; the only remarkable feature is the quantity of hair which always seems to be present in the under-coats. The mode of application has that simplicity and directness which is characteristic of good craftsmanship. Given a wall, whether of brick, timber, wattle and daub; given also certain openings in that wall; and the problem—to plaster it in an interesting manner. Dismissing all thoughts of brick, stone, or carpentry technique, and thinking in plaster, the natural course at once seems to be to divide an unmanageable area into a number of workable ones. This is done by screeds. The position and grouping of the door and window openings readily suggest the lines that these shall take. The remainder of the wall surface now presents a series of panels (though I am loth to use the word, as suggestive of joinery, which the work itself is not). These "panels," so divided, form spaces of workable size, which it is possible to decorate individually upon the wet plaster before it commences to set.

It must not be assumed, however, that so wholly satisfactory and logical a treatment was achieved as soon as thought had been directed to the decorative possibilities of these protective coats of external plastering. There was at first shown a tendency to spread ornament rather recklessly over every available surface, as seen in the mediæval house at Clare, Suffolk. The earlier Elizabethan and Jacobean work also was apt to be rather unrestrained in its application of ornament. Charming as such work now looks, it is perhaps rather questionable whether some of its charm is not due to the softening hand of time. The house in Hadleigh, with its delicate low relief ornament, seems to me to present a better type. The well-known Sparrowes House at Ipswich and Crown House at Newport, Essex, are both characteristic of their period, but the relief of their ornament seems too great to be natural for plaster. A better specimen of this type is the fine house at Framlingham, illustrated in "Field and Bunney," which shows an excellent sense of fitness and restraint.

All these examples are houses of some pretension, where presumably the best craftsmen of their day could be employed. The smaller houses and cottages were at first content with a very limited use of ornament—perhaps an isolated fleur-de-lys, Tudor rose, or similar badge, as in the house at Kersey, and in many instances at Lavenham; or the long-suffering swag, as at Hadleigh. However the latter treatment (which I will call "texture ornament") may have originated, its use soon became very general. I have a theory that it arose from some clear-thinking genius being struck with the good effect of the scratch coat when keyed for finishing. As it is, the key of a rough "Mack" slab is very similar to some of the Suffolk patterns, which gave me this hint. The patterns, which are both impressed and inscribed, are most simply and economically produced in great variety, and each district has its special favourite. The tools are primitive but effective. One—a five-toothed comb with rounded teeth—produces the "guilloche," "basket," and "reeded" inscribed patterns, and the impressed "chevron." The fan-scale pattern is produced by a kind of rake with one prong longer than the others, and a handle at right angles. Other patterns are the "bird's foot," the "dot," and the

"rope," and all have many minor variations. When executed on the bare plaster the patterns are not particularly attractive; the softening effect of a few good thick coats of whitewash is requisite.

In conclusion, a word of warning. If anyone should have any idea of employing these methods in the future, let him be careful to see it done. Otherwise he will probably find that the whole has been carefully set out with rule and square and executed with a mathematical precision in its main lines and utterly cramped lack of freedom in its details, which he will, I fancy, quite fail to appreciate.

Enquiries Answered.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters. Correspondents are particularly requested to be as brief as possible.
The querist's name and address must always be given, not necessarily for publication.

Model of the Pantheon.

Referring to the enquiry under this head that appeared recently in our columns, several correspondents write pointing out that a model of the Pantheon at Rome can be seen in one of the architectural courts at the Crystal Palace, where also are models of the Colosseum and other buildings.

The Government and Right of Light.

LONDON.—ALPHA writes: "A friend of mine has some property which has been standing for about 40 years. The Government is erecting a building in his rear which will seriously affect his light and air. He has been told that the law relating to light and air does not affect the Government. Is this so, or could we recover in the usual way?"

Government buildings are exempt from the operation of the London Building Act and similar building regulations, but I believe your informant is mistaken in supposing that action cannot be taken against them in case of a nuisance resulting from any building erected by them. Consult a solicitor without delay. G.

Polishing Oak Joinery.

LONDON.—S.D.T. writes: "What would be the process described in a specification as 'Prepare, body in, and wax-polish the whole of the oak joinery'?"

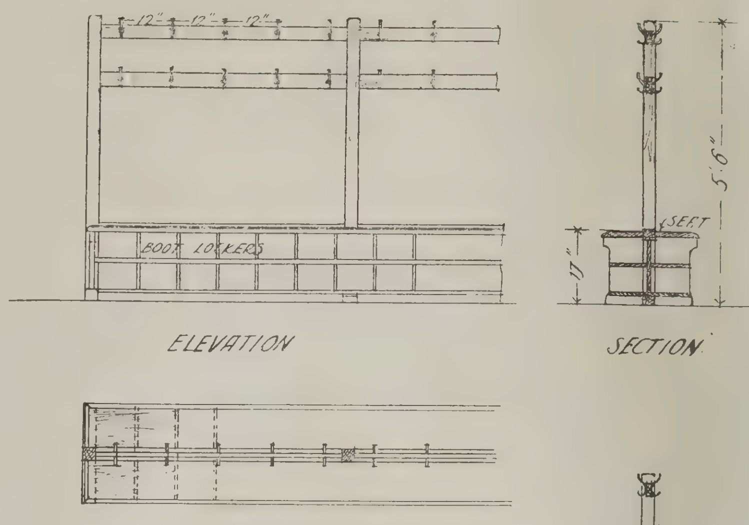
Bodying in and wax-polishing consists of rubbing in (with a cloth) beeswax which has been melted, and to which is added spirits of turpentine, to bring it to the consistency of cream. The first application, or bodying, is for the purpose of filling up the pores and to open the grain of the wood. The second application is performed in a similar manner, using a piece of cloth as a rubber. The more labour bestowed in rubbing, the better the result. For oak floors a hard brush is sometimes used. T.P.

Cloak-room Racks.

CHELMSFORD.—DEPUTY writes: "I often see cloak-rooms in published drawings of schools with racks shown as in sketch (not reproduced). Could you spare space to describe these, and, if possible, give a sketch of their section?"

Cloak-room racks may be planned with a seat on either side of the centre rack, as in Fig. 1; the width of the stand, including seats and pegs each side, may be taken as about 18 ins. They are sometimes provided, however, with one or more tiers of lockers to hold boots, the top of which serves as a seat (Fig. 2). The upright division may be open, or, as is usually the case in elementary schools, filled in with wire netting, which assists in preventing pilfering, and at the same time provides for a free circulation of air. The height of the rack is usually about 5ft. 6ins., the hooks or pegs being placed about 12ins. apart.

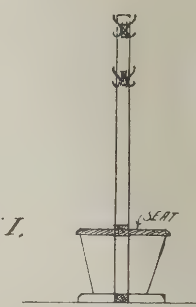
FIG. II.



ELEVATION SECTION

PLAN

FIG. I.



SECTION

Enclosure of Common.

A.H.S. writes: "On a common not subject to regulation under any of the Commons Acts, it is proposed to erect a small games' pavilion. (1). Is this an enclosure within the meaning of the Inclosure and Commons Acts? (2). If it is, could it be effected under the statute of Merton and Commons Amendment Act, 1893?"

(1). Certainly the erection of a pavilion, however small, is an enclosure under both the common and the statutory law. (2). The unenclosed land in question is, doubtless, within some manor, and the only persons to be consulted are the lord of that manor and the tenants ("the homage") of the manor (unless indeed the proposed enclosure is within the statutory distance from the centre of a public road). The lord of the manor may make the enclosure, provided a sufficiency of pasture is left for the tenants of the manor who possess rights of common. One must remember that the public have no rights in such a case: no one but the lord and his homage having any "locus standi."

F.S.I.

Book on Entrance Gates.

WELLINGTON.—A.H. writes: "Can you recommend a book on wood entrance gates to private residences—designs and particulars?"

No book has been published dealing with wooden entrance gates. Several manufacturers, in their copyright lists, give very excellent designs by well-known architects, for both carriage and wicket gates, but these could not properly be made use of as you wish. G.

Centering for Dome.

LONDON.—C.P.W. writes: "Being much interested in the articles on Domes by Mr. Dunn in 'The Architectural Review,' I should be glad if you would give some description of the centering used for a tile and cement dome, such as Columbia Chapel. Would continuous shaped support be necessary under the entire surface?"

We have communicated with Mr. Dunn, but he has no information to give on the subject of the centering for the tile and cement dome used in Columbia Chapel.

Herne Church.

GRAVESEND.—W.D. writes: "Can you refer me to any written matter on Herne Church, Herne Bay, Kent?"

Notes on St. Martin's Church, Herne, will be found in a book entitled "Notes on the Churches of Kent," by the late Sir Stephen R. Glynne, Bart., and published in 1877 by John Murray. H.Y.M.

Area of Segment of Circle.

LONDON.—P.G.C. writes: "How is the following formula (area of segment of a circle obtained?:—

$$\text{Area} = \frac{\text{height} \times 2 \times \text{chord}}{3} + \frac{\text{height cube}}{2 \times \text{chord}}."$$

The formula (1) Area $= \frac{2}{3} sv + \frac{v^3}{2s}$ is widely known as a simple way of getting the area of the segment of a circle, but the writer cannot undertake to say how it is derived. The following are additional formulæ for the same purpose (in each of them s = span or chord, and v = versin or rise or height):—(2) Area $= \frac{2}{3} sv + \frac{8v^3}{15s}$.

(3) Area $= \frac{4v}{3} \sqrt{(0{\cdot}625v)^2 + (\frac{1}{2}s)^2}$.

(4) Area $= \frac{2}{3} sv + \frac{56v^3 s}{15(7s^2 + 4v^2)}$

There are other formulæ, still more complicated, for use when it is desired to be very exact These may be obtained from Cassell's "Engineer's Handbook," price 8s. 6d. net.

HENRY ADAMS.

Architects' Provident Fund.

LONDON.—ALPHA whites: "Is there any society for architects (like the Artists' Fund) which, by paying a yearly subscription, provides assistance for them (or their widows) in time of sickness or death, or while they are out of a berth?"

There is no society among architects on the same lines as the Artists' Fund. The Architects' Benevolent Society, though having similar objects, is supported by subscriptions and contributions, and does not appear to provide such a method of insurance as you desire. At their recent annual meeting, however, some such proposal was made, and would certainly be a good thing. G.

Repairs and Materials.

NORTHUMBERLAND.—BUILDER writes: "Is there any book I can get on general repairs to buildings? I want one giving a description of timber, how to judge it, also of bricks."

"Repairs: How to measure and value them," by J. T. Rea (Batsford, 94, High Holborn; price, 3s. net) is a useful book. "Building Materials," by G. A. T. Middleton (same publisher, price, 10s. net), will give much information as to the qualities to be looked for in good and bad materials respectively; but in case any work of importance is to be executed, it will be better to obtain the assistance of a skilled surveyor or clerk of works. G.

Hammer-Beam Roof Truss.

SUNDERLAND.—G.H. writes: "Kindly let me know what scantlings the principal members in truss, as shown on drawing sent, should be. Also, is a buttress necessary with walls 18ins. thick? And is a tie-rod necessary?"

Fig. 1 shows the truss with the principal scantlings, a modification having been made to render a tie between hammer-beams unnecessary. In the truss shown in this figure the walls must be strongly buttressed to ensure their carrying the horizontal thrust. If, however, there is no objection to a tie-rod between the hammer beams, it should be put in, as the buttresses need not then be nearly so strong, and the stress on the truss itself will then be less, so that the scantlings could be made lighter, the truss becoming practically equivalent to a queen-post truss. Assuming that the buttresses are sufficiently strong, the stresses can be found as follows:—Fig. 2 shows the equivalent frame-diagram, with the loads acting on the truss. To find the reactions, *i.e.*, the point 8 on the stress diagram, Fig. 3, set out the loads on the link 0—7, and take any pole P. On drawing the link or funicular polygon, shown dotted in Fig. 2, and drawing P8 parallel to the closing link of this polygon, we get the point 8 required. The stress diagram can then be drawn, as shown in Fig. 3, without much difficulty, and the stress in any member can be obtained. Any yield of the buttresses would, of course, alter all these stresses, and therefore in this type of truss the actual stresses cannot be obtained with anything like the accuracy possible in a determinate frame. A.

Pembridge Church, Herts

TIPTON.—H. C. writes: "Please give me some approximate dates of Pembridge Church, Herefordshire, or better still, tell me of a book with a description and dates of the church."

There appears to be no book giving the information you require. It would be of service to the archæologist and architect for you to compile an original pamphlet on the subject. H. M.

Book on Decoration.

LONDON.—ALPHA writes: "Can you recommend a book on interior decoration?—something on the lines of Banister Fletcher's 'History of Architecture' would suit—taking each style separately, with letterpress describing illustrations."

There is no book dealing comprehensively with all the historic styles as exhibited in interior decoration alone. Reference must be made to numerous works to obtain what you require. "English Interior Woodwork of the XVI., XVII., and XVIII. Centuries" deals well with work of the English Renaissance. It is published by Mr. Batsford, price 36s. net. Other styles must be sought out from works dealing generally with their respective periods. G.

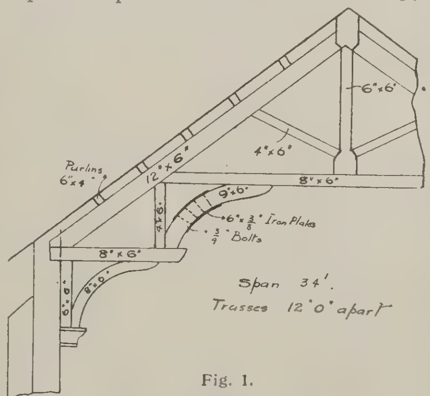


Fig. 1.

Notes and News.

AN ARTICLE ON "HOW TO BECOME AN ARCHITECT," by Mr. F. M. Holmes, appears in "Cassell's Magazine" for April.

* * *

A SLIDING ROOF AT THE SAVOY HOTEL is being fitted over the old courtyard and the annexe, which is on the same floor as the foyer.

* * *

LEEDS AND YORKSHIRE ARCHITECTURAL SOCIETY.—At last week's meeting of this Society Mr. Percy Robinson was elected president for the ensuing year, and Mr. F. E. P. Edwards and Mr. H. A. Chapman were elected vice-presidents.

* * *

THE NEW TOWN HALL AT STOCKPORT, which has been erected from designs by Sir A. Brumwell Thomas, F.R.I.B.A., of London, is to be formally opened by H.R.H. the Prince of Wales on July 10th next.

* * *

R.I.B.A. PRIZES AND STUDENTSHIPS, 1909. — A pamphlet giving the subjects and particulars of the competitions for the 1909 prizes and studentships of the Royal Institute of British Architects will be issued shortly.

* * *

MESSRS. STUART'S GRANOLITHIC STONE CO., LTD., the well-known firm of constructional engineers, patentees of "Granolithic" paving, etc., and reinforced concrete specialists, have opened City offices at No. 4, Fenchurch Street, E.C. The offices at their works, Millwall, E., will still be continued.

* * *

JUNIOR INSTITUTION OF ENGINEERS.—Sir William Huggins has been elected a vice-president of this institution, in succession to the late Lord Kelvin. Sir Archibald Geikie and Professor J. J. Thomson have also been elected. The first local section in connection with the institution (now numbering more than 1,000 members), has been established at Birmingham, with Mr. F. S. Pilling as chairman and Mr. R. B. A. Ellis (67, Wordsworth Road, Small Heath) as hon. secretary.

* * *

THE FORTHCOMING MUNICIPAL EXHIBITION. — We are informed that excellent progress is being made with the Municipal, Building and Public Health Exhibition to be held at the Royal Agricultural Hall from May 1st to the 12th. A special conference is being organised in

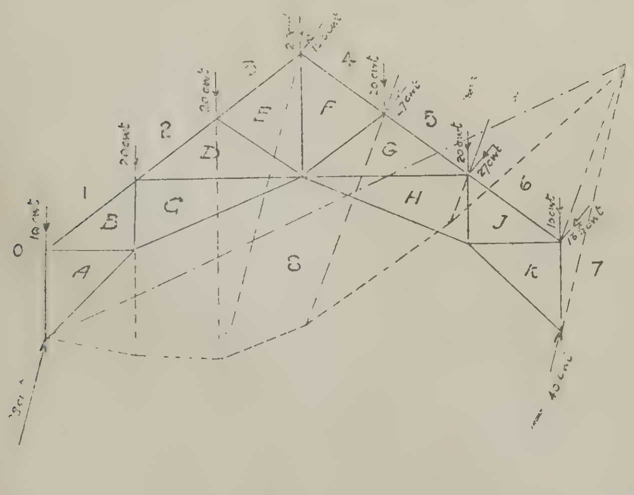


Fig. 2. Frame Diagram.

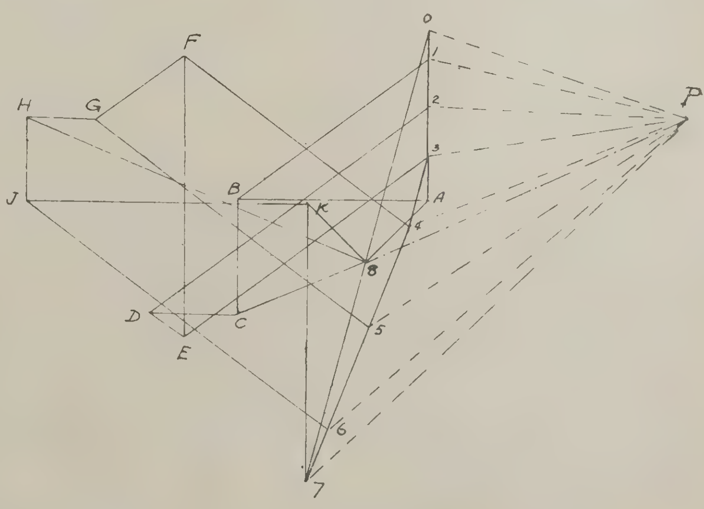


Fig. 3. Stress Diagram.

HAMMER-BEAM ROOF TRUSS.

connection with the Exhibition, and it is hoped to arrange for municipal officials, councillors, etc., to visit places of interest on certain days. Among the papers promised are some dealing with water supply, lighting and light measurement, utilization of refuse clinker, and reinforced concrete. Full particulars can be obtained from the Organising Managers of the Exhibition, Balfour House, Finsbury Pavement, London, E.C.

* * *

MESSRS. JAMES ALLAN, SENR., AND SON, the well-known firm of ironmongers and constructional engineers, of Glasgow, have re-opened their works as a private limited company. Arrangements have been made with the trustee in the sequestrated estate to take over the entire business, including plant, patterns, goodwill, etc., and it is confidently anticipated that the company will have a prosperous career.

* * *

THE NEW ROOF AT CHARING CROSS STATION.—It will be recollected that the roof of Charing Cross Station, which collapsed about two years ago, was a single-span roof: the new roof is of the ridge-and-furrow type. The span of the old roof was 166ft.: in the new roof the longest span is less than 40ft. Practically the whole of the roof is glazed, the only exception being the jack roofs of the transverse bays, which are covered with Uralite on close boarding.

* * *

KOH-I-NOOR PENCILS.—These pencils are certainly the very best we have come across. They are most carefully made, and last much longer than any others we have tried. Moreover, they can be obtained in no fewer than seventeen different degrees, and thus meet every possible requirement. We have received from Mr. Fredk. E. Potter, of 56, Ludgate Hill, E.C., some cards with samples of Koh-i-Noor pencils, and it gives us the greatest pleasure to recommend them, though we doubt not that most of our readers are familiar with the excellence of these pencils, and use them regularly.

* * *

A CASINO FOR BRIGHTON is proposed to be erected on the foreshore between the West Pier and the borough boundary, between the Bedford and Norfolk Hotels. Messrs. Clayton and Black, of Brighton, are the architects for the scheme, which is estimated to cost £200,000. They have prepared a design for a building with a frontage of 464ft., comprising a winter garden 80ft. in diameter, a grand saloon 100ft. long, and accommodating 1,500 persons, a large assembly hall, a concert hall and theatre, billiard-rooms, reading-rooms, a real-ice skating rink in the basement, and a marble-lined salt-water bath, for both sexes.

* * *

SANITARY ASSURANCE ASSOCIATION.—The 27th annual meeting of this Association was held on March 23rd at the offices, 7, Pall Mall, W., the president, Mr. Walter Butler, M.I.C.E., in the chair. The annual report referred to the surveys, specifications, supervisions of works, and issue of sanitary certificates being continued on the plan initiated in 1880. The financial statement proved that the work continued to be appreciated, and after meeting all liabilities a balance was carried forward. Reference was made in the report to the death of Sir Joseph Fayrer, the first president of the Association. It was pointed out that the masters of schools, proprietors of hotels, and governors of hospitals and other institutions who are clients of the Association find the certificate of special value, for not only can it be quoted in answer to enquiries as to the sanitary condition of the premises, but, in the event of infectious disease appearing, can be produced as evidence of the sanitary arrangements being in order, thus preventing needless alarm and saving the expense that might otherwise be incurred by overhauling the buildings. (The secretary of the Association is Mr. Max Judge.)

* * *

THE ARCHITECTURE OF DALMATIA was dealt with by Mr. F. Gordon Brown before last Wednesday's meeting of the Edinburgh Architectural Association. The lecturer said the Dalmatian architecture was principally based upon that of Italy, but with differences due to Byzantine and Roman influence, entitling it to be ranked as a style by itself. It was reminiscent of the Northern Gothic, doubtless due to the Hungarian suzerainty, under which French and German architects were employed. One special peculiarity was the persistence of the Romanesque style long after every other country in Europe had abandoned it in favour of Gothic. This Mr. Brown traced partly to the influence of Italy, and partly to the preference of the Dalmatians to the earlier style, and the never-failing influence of Diocletian's Palace at Spalatro.

* * *

MARBLE ARCH IMPROVEMENT: THE ROYAL GATES.—The design for the Royal entrance gates to Hyde Park, prepared (it is understood) in H.M. Office of Works in connection with the Marble Arch Improvement, is now shown in the members' tea-room at the House of Commons. The general design of the ironwork is in keeping with that of the fine gates recently erected at the end of the Broad Walk across the Green Park in connection with the Victoria Memorial. The Royal gates themselves are 16ft. wide and 18ft. high, and they have as their central ornament the Royal arms surrounded by the chain of the Order of the Garter, and surmounted by the Royal crown. In the lower panel of the gates the Tudor rose is introduced. The stone piers on either side are 4ft. 6ins. square and 16ft. high, and are surmounted by finely-designed lamps with the crown on top. On either side of these piers there will be an iron grill 10ft. long, having the Tudor rose surmounted by the Royal crown as their centre ornament; and on each side of the grills there will be corresponding stone piers with lamps, while beyond them will be the gates for the general park traffic. The length of the whole design is considerably over 100ft.

Our Plate.

Detail of Main Entrance to the Louvre, Paris.

During the First Empire considerable alterations were made to the Louvre by Percier (1764-1838) and Fontaine (1762-1853), who enlarged and decorated it with sufficient taste and skill to avoid any want of harmony with the existing older portions of the building. These two clever architects, each of whom was a *Prix de Rome*, were pupils of Antoine François Peyre, and when the Empire was proclaimed their services were in great request for much of the architectural work that was instituted under the new régime. The detail of the main entrance which we reproduce as a centre plate this week is a good example of their work at the Louvre.

R.I.B.A.

Mr. George Hubbard on "The Cathedral Church of Cefalu, Sicily."

A meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., the chair being occupied by Mr. Henry T. Hare, vice-president.

Mr. George Hubbard, F.S.A., F.R.I.B.A., read a paper on "The Cathedral Church of Cefalú, Sicily."

Mr. Hubbard in introducing his subject said he had had the good fortune in 1884 to be quarantined for nine months in Sicily, owing to an outbreak of cholera; and he spent more than a month of that time at Cefalú studying the Cathedral and making measured drawings of it. In 1896 he again visited the island for the purpose of correcting and completing the work he had commenced twelve years before, and now, after the lapse of yet another twelve years, he ventured to lay before members such evidence as he had in support of the theory that pointed Gothic work was derived from the pointed Norman work of Sicily, and particularly from Cefalú.

Mr. Hubbard showed by plans thrown upon the screen that Cefalú was the only building designed on the plan of the Latin Cross. No contemporary church in Sicily had the distinctive Gothic plan to be seen in that building; it also contained other important Gothic features not to be found in Europe in any church of so early a date. For instance, the intersections in the pointed groined work of the choir are marked by the projecting ribs which are peculiarly characteristic of Gothic work. The author had found no authority quoting the vaulting at Cefalú, which is quadripartite, ribbed, and pointed. This vaulting might very probably have been completed in the year when similar vaulting was adopted at St. Denis, which is generally accepted as the earliest form of true Gothic vaulting. There appears to be considerable probability, however, that the Sicilian example is the earlier. The special and predominant feature in the church is the pointed arch. The whole of the original structural arches are pointed throughout the church, excepting the small round arches of the gallery or triforium between the roof vaulting and clerestory windows in the south transept. The predominating influence in the general design and in the details of the east elevation is unmistakably Norman.

In further support of his theory that Norman and not Saracenic hands had laboured upon the structure, Mr. Hubbard directed attention to the masons' marks he had found besprinkled about the building. There was no doubt, he thought, that a vast number of these would be found to be reproduced upon mediæval buildings throughout Europe. He had compared a few from Canterbury, Lincoln, and Fountains, which in some cases were precisely similar to those at Cefalú, and others bore a strong similarity. Wandering gangs of adopted masons doubtless congregated whereever important works were in progress, and they evidently affixed their signs on the stones they wrought and dressed.

The point the author particularly emphasised was that at Cefalú the Norman, or in this case the Gothic, pointed arch was used probably as a distinct style at an earlier date than in any other building, and that consequently Cefalú should be accorded the highest position in the history of Gothic architecture.

Correspondence.

Ilford Emergency Hospital Competition.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—From the "Answers to Questions" which have just been issued in connection with the above, it appears that Richard Green, Esq., F.R.C.P.Edin., was appointed assessor prior to the drawing-up of the conditions, and that being so, we presume he is responsible for these "Answers." Having carefully considered them, we are of opinion that the assessor is utterly unqualified for his task in an architectural competition of this kind, and how a medical man of Mr. Greene's standing could have permitted himself to be placed in such an altogether untenable position we fail to understand.

Mr. Greene should have advised the Governors as to the requirements of the district, the number and accommodation of the wards, and the various matters connected with the medical side of the proposed hospital—all of which the Governors should have considered before deciding to build—and then have left it to an architect well acquainted with hospital planning to place these requirements in a technical form, and to act as assessor in the competition. Why, here is a hospital committee with a medical assessor who have not yet decided what the proportion of medical to surgical cases is likely to be in the district!

The title "emergency hospital" is wrong; no wonder the question was asked if it had any "special significance." It is in no sense an emergency hospital.

Here are a few of the deficiencies:—No isolation ward is required in this hospital for 100 beds; the number of wards has not been decided upon; wards for paying patients are required, but the promoters have no idea of the number of beds that will be necessary; the mortuary is to be placed as far away as possible from the only entrance to the site; the block plan may be practically to any scale convenient to competitors; the cost of the completed hospital is an unknown quantity—the Governors merely expressing the hope that what they want may be obtained for £5,000.

Clearly, this is a layman's competition, with a layman as assessor, and architects who compete in these circumstances had better confine their efforts to prettily coloured drawings and perspective sketches, not forgetting that the "main staircase should not be less than 4ft. 6ins. wide, with treads of 12ins. and risers of 7ins."

Yours truly,
H. DIGHTON PEARSON, F.R.I.B.A.
W. GODFREY MILBURN, A.R.I.B.A.
London, W.C.

The Shakespeare Memorial.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Your reference to Mr. John Davidson's remarks upon the subject of the proposed Shakespeare Memorial prompts me to suggest that the statements made by that writer would appear to be unduly drastic, not to say very deprecatory to the ability of our modern sculptors. I venture to say that London is sufficiently deficient in *good* sculptural monuments to warrant the erection of yet another group of statuary, even if the actual statue in this case be the replica of an existing one, and perhaps for this purpose it would be hard to find a better example than the expressive figure by Roubiliac in the entrance hall to the King's Library at the British Museum, if the authorities are willing to part with it or to allow a bronze cast to be made for this laudable object.

In any such monument the introduction of the names, and, where possible, the figures of the actors themselves who have been prominently associated with Shakespeare, will doubtless be made, as on the Albert Memorial. The chief of these are, I believe, Heminge, Condell, and Burbage, who were immortalised by Mr. C. Clement Walker in his pamphlet entitled "John Heminge and Harry Condell" (1896), from which it appears that the two latter collected and published Shakespeare's works in 1623, after the poet's death. They were both buried at St. Mary, Aldermanbury—Condell in 1627 and Heminge in 1630.

Yours truly,
ALBERT E. BULLOCK, A.R.I.B.A.
London, W.C.

"A Garage Roof."

To the Editor of THE BUILDERS' JOURNAL.

SIR,—In your issue for March 18th you publish an interesting illustrated article entitled "A Garage Roof." In the description of this structure you say, ". . . the steel construction to the garage was carried out by Messrs. Peirson and Co., of St. Dunstan's Hill, E.C., whose new departure in roof construction for large spans was adopted. . . ."

I would like to say that although this may be a "new departure in roof construction" so far as Messrs. Peirson and Co. are concerned, it is only just to other structural contractors to call attention to the fact that this method of construction, on the principle of the cantilever, or "umbrella," type of roof, with large-span lattice girders, and without intermediate supporting columns, has for many years past been adopted in a large number of workshops and similar structures erected in England and Scotland, and illustrated from time to time in the engineering technical press.

Yours truly,
A. G. HARRISON.
Westminster.

Notes on Competitions.

Boys' Secondary School, Maidenhead.

From the 145 designs submitted in this competition, the assessor has placed the following:—1st, Mr. A. Jessop Hardwick, F.R.I.B.A., of Kingston-on-Thames; 2nd, Messrs. Wallis and Bowden, of Westminster; 3rd, Messrs. R. R. Barnett and T. F. Hawkes, of Putney. The number of designs submitted being so large, the Berkshire Education Committee found it impossible to exhibit them all, but the first three have been shown for the past few days at the offices of the committee, The Forbury, Reading. The cost of the new school is estimated at £5,000.

Secondary School (County High School), Harwich.

The awards in this competition are as follows:—1st, Messrs. Brown and Burgess; 2nd, Messrs. Eade and Johns; 3rd, Messrs. Bisshopp and Cautley—all of Ipswich. Mr. Leonard Stokes, F.R.I.B.A., was the assessor. There were thirteen competitors. The school will cost about £6,500.

Conway Municipal Offices.

An open competition was lately held by the Conway Corporation for converting the old post office into municipal buildings. The plans sent in were submitted to Messrs. Porter and Elcock, architects, of Colwyn Bay, as assessors, and their report was considered before a special meeting of the Corporation held on March 18th. After consideration and the reading of the report, the Corporation accepted the award of the assessors, and on the envelopes being opened the plans of Mr. F. D. Cheers, architect, of Gainsborough Road, Sefton Park, Liverpool, were found to be the winning set, and the surveyor was instructed to write to him on the matter.

The Shakespeare Memorial.

A meeting of the executive committee of the proposed Shakespeare Memorial was held at the House of Lords on Friday last, when final arrangements were made for carrying out the resolutions passed by the General Committee at the Mansion House meeting held on March 5th. The particulars of the competition, open to sculptors and architects, as drawn up by the Advisory Committee (Sir Aston Webb, Mr. Brock, and Mr. Belcher), were approved, and it was decided that the sketch designs for the first part of the competition must be delivered not later than January 1st, 1909. The terms will be made known in the Press without delay. The Committee of Selection, who will decide the competition, was finally constituted as follows:—The Earl of Plymouth, Viscount Esher, Sir E. J. Poynter, Sir Aston Webb, Mr. Brock, Mr. Belcher, Mr. Sydney Colvin, Mr. Sidney Lee, Mr. J. Forbes Robertson, and a sculptor to be nominated by the American Ambassador.

Hospital Extension, Eastbourne.

A competition is being held among the architects in Eastbourne for the proposed enlargement of the Princess Alice Hospital. Accommodation is to be provided for a minimum of twenty additional beds, and proportionate sleeping accommodation for the extra nurses required. Designs have to be sent in by May 1st.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
May 1	FARM BUILDINGS.—Premiums £50, £25, £15 and £10. Particulars from Thomas McRow, Secretary, R.A.S.E., 16, Bedford Square, W.C. Summary in BUILDERS' JOURNAL, March 25th.
May 8	DOOR AND WINDOW FITTINGS.—(Assessors, Mr. Henry T. Hare, F.R.I.B.A., and Mr. Leonard Stokes, F.R.I.B.A.). Premiums of 15, 5 and 3 guineas. Particulars from N. F. Ramsay & Co., 1, Victoria Street, Westminster.
May 15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
1909. Jan. 1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date: final competition to be limited to six competitors. Particulars of competition will be issued very shortly.
No date.	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to Architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall Eccles, Lancs.

Law Cases.

An Architect's Claim: Important Case.—At the recent Londonderry Assizes, before Lord Justice Holmes and a special jury, an important action was heard in which the plaintiff was Mr. Matthew A. Robinson, M.I.C.E., of Derry, and the defendants were Messrs. George Austen and Co., drapers, of Derry. Plaintiff's claim was to recover £225 for work done and materials supplied in connection with the erection of defendants' premises under an alleged agreement made on January 23rd, 1903, whereby the defendants agreed to pay plaintiff 4½ per cent. on the cost of the rebuilding; and to recover £175 for work done in connection with a claim made by the defendants against various insurance companies for compensation for loss caused by fire, and for preparing drawings and obtaining tenders for the shop fronts of the premises. Defendants were entitled to credits, amounting to £165, for money paid on account and for contra account, leaving due a balance of £235. Plaintiff averred that he prepared the plans and specifications, and obtained tenders for the work, and supervised the erection of part of the work, but when half was erected the defendants refused to complete it, and put an end to the agreement. Plaintiff claimed £100 for the preparation of the plans for work abandoned in breach of the contract, estimated at the rate of 2½ per cent. on £4,000, and £100 for the loss of profit for supervision of the work so abandoned. Defendants denied the agreement. They said that plaintiff was verbally employed as architect for the work, the cost of which was not to exceed £6,000, and that the plaintiff agreed to remuneration at the rate of 4½ per cent. Plaintiff prepared the plans, but the lowest tender submitted was £13,300, whereupon the defendants refused to allow the work to proceed, and, therefore, plaintiff was not entitled to any remuneration for his work. Defendants said further that the plaintiff prepared fresh plans, and that the lowest tender submitted for these amounted to £9,600, whereupon they refused to accept it, and said that they would carry out the work with their own workmen on the basis of the fresh plans, the expense having been reduced by modifications in the estimates. Defendants completed the work, which cost £5,500, and as to the balance of £500 left unexpended, they contended that plaintiff was entitled to payment at the rate of 2¼ per cent. On their counter-claim defendants claimed £150 for damages occasioned by reason of the plaintiff's alleged negligence in the preparation of the original plans, and £100 as costs incurred in connection with the acquirement of the lessor's interest in the premises. They also claimed damages for alleged negligence on the plaintiff's part in not obtaining tenders for steelwork in time for delivery at the premises on October 1st, 1905. The steel was not delivered until the month of December in the same year, its price having risen in the meantime, and defendants said they were compelled to take delivery at a much enhanced price. In reply to the counter-claim, the plaintiff denied that he was guilty of negligence and that the defendants had suffered damage, as stated. It was not a term of the agreement that the cost was not to exceed £6,000, and no limit was fixed. He denied that the fact that the lowest estimate was for £13,300 was due to any want of skill or care on his part. He further said that he was not informed of the negotiations or agreement between the defendants and the lessor. With regard to the tenders for the steelwork, he said he had taken all necessary diligence in getting them, and he was not guilty of any negligence on that score.—During the progress of the case the plaintiff withdrew the claim for damages in respect of the abandoned work, and also several of the items in the bill of extras. Defendants abandoned the claim in respect of the steel contract.—His Lordship put ten questions for the decision of the jury, who gave a verdict for the plaintiff and against the counter-claim.—With the assistance of counsel the items were then gone into, and it was arranged that the plaintiff should receive £105 over and above the £113 paid into Court by the defendants.—Judgment was entered for the plaintiff accordingly.

Fibrous Plaster Cornices.—At the Southampton County Court recently the case of Gargano Bros. v. Frank Kimber, was heard. The plaintiffs are modellers, and the defendant is a builder, both of Southampton. The claim was for £17 9s., the price of some fibrous plaster cornices supplied to the defendant. Mr. Hiscock, stating the case for the plaintiffs, said that in December last the defendant (who was building a house in Northlands Road) called at the plaintiffs' premises, and asked to see a sample of their cornices. Defendant said he would have the cornices in his new house, and would arrange for Mr. Gutteridge, his architect, to select the patterns, and then give an order for the quantity that might be required at the house. At that interview the question arose as to fixing the cornices, and defendant arranged for his own carpenter to fix one room. On December 20th Mr. Gutteridge selected the patterns required for the defendant's various rooms, and, later, defendant wrote out an order for the quantity of cornices required. The cornices were duly delivered. Subsequently the defendant called on the plaintiffs and said they had better stop the order, and that he did not require any more of the cornices. Defendant alleged that the cornices were not straight, and that the joints did not come together. Plaintiffs replied that the defendant's men had not fixed the cornices properly. Defendant directed that a portion of the cornices should be pulled down and re-fixed by plaintiffs, and considerably difficulty was experienced in doing this, because the cornices had originally been fixed by inexperienced men. Mr. Gutteridge condemned the work. As a result of what had happened, defendant sent back some of the goods by his carter, who, acting on instructions, threw them over into the plaintiffs' premises. Defendant refused to pay for the goods, but had since paid £3 into Court, with a denial of liability.—For the defence it was contended that a trial order, and nothing more, was given. Plaintiffs introduced the material, not to the defendant, but to Mr. Gutteridge, the architect, with a view to getting orders. Mr. Gutteridge had said that he liked the material shown him by the plaintiffs very much, but had never seen it fixed, and wanted some experience of it. When he saw the cornices fixed he did not consider the work was satisfactory. If plaintiffs manufactured the cornices for the whole of the house they did so at their own risk, with a view to their being accepted. Plaintiffs fixed up a portion of a room for Mr. Gutteridge's inspection, and Mr. Gutteridge found the cornices wavy, and entirely unsuitable for the room. Defendant returned the quantity that had not been used, and agreed to pay for the amount used, and for plaintiffs' labour in fixing a portion.—His Honour Judge Gye stopped the case, and gave judgment for the defendant.

The Meaning of "Flush-Panelled."—An action of interest to the building trade was tried by Deputy Judge Leresche in the Manchester County Court on March 26th. Messrs. J. W. Southern and Son, timber merchants, of Manchester, claimed £1 19s. 1d., the price of ten "flush-panelled" doors, from Messrs. W. Elliott and Co., millwrights, of Levenshume. The defendants counter-claimed for £1 14s. 6d., on the ground that the doors were not made in accordance with instructions, and that consequently they needed to be re-made. The case was before the court on a previous occasion, but was adjourned to allow both parties an opportunity of calling evidence as to the meaning of "flush-panelled" in the trade. With the order for the doors the defendants had given a sketch bearing those words, and their contention was that "flush panelled" meant that the doors were to be "flush-panelled" on both sides. For the plaintiffs six expert witnesses affirmed that the words in general use simply meant that the doors should be flush on the face or outer side. When required to be flush on both sides it was necessary to write on the plan or sketch, "Both sides to be alike," or something to that effect. Asked whether this would apply in the case of a swing door, Mr. George Ginger, a builder of 24 years' experience, asserted that it would. Mr. Elliott, head of the defendant firm, stated that when he gave the order and the plan he distinctly told the plaintiffs' secretary that the doors were for use in a passage, and must swing both ways. The order, moreover, was given on a circular form containing words to that effect. Asked whether he had brought any witnesses in proof of his assertion that it was a trade custom to regard "flush-panelled" to mean flush on both sides of the door, he said he had only his son.—His Honour remarked that he had no doubt whatever that the plaintiffs were right, and they must have judgment on both claim and counter-claim. As the case was one of importance to the trade, the costs would be on the B scale, and he should certify for the six witnesses.

Claim in Respect of the Brooklands Motor Racecourse.—At the West Riding Assizes at Leeds on March 26th, an action was concluded in which the Yorkshire Hennebique Contracting Co. were the plaintiffs and Hugh Fortesque Locke-King was the defendant. The claim was for £2,666, balance of a contract for £4,666 for the erection of a bridge over the river Wey to carry the Brooklands Motor Racecourse. It was alleged by the defendant that the bridge was not equal to bearing the weight and resisting the thrust of racing motors, and that he had had to spend £1,040 in putting it in order. He counter-claimed for the whole of that amount, and for so much of the £2,000 paid on account of the contract as was necessary to extinguish the plaintiffs' claim. After considerable expert evidence had been given on behalf of the plaintiffs, an agreement was arrived at. Counsel for the defendant said he was prepared to accept judgment against him for the claim, less £350, and the plaintiffs acquiesced. Judgment accordingly.

RETAINING WALLS IN THEORY AND PRACTICE.

BY T. E. COLEMAN.

(Continued from page 214, No. 684.)

We have seen that the maximum and minimum conditions of statical stability for a retaining wall at any bed-joint are obtained when the centre of pressure is at the centre and outer edge of the bed-joint respectively. There is consequently some point between the centre of the bed-joint and the outer edge at which the resultant force produces a zero pressure at the inner edge, together with a uniformly gradual increase of pressure from the inner to the outer edge of the bed-joint, as in Fig. 29.

According to the investigations of Moseley, Rankine, Crofton, and others, it is found that in any bed-joint this definite point is reached when the "centre of pressure" (C) is exactly one-third the width or thickness of the bed-joint from its outer edge. This may be readily understood by comparing Figs. 29 and 30. In Fig. 30 the total normal pressure (N) on the bed-joint is shown as being *equally distributed* over the entire bed, as indicated by the pressure diagram A B E H; the mean normal pressure being $\frac{N}{t}$. The vertical pressure at any point on the bed-joint A B is represented by the length of the ordinate or vector drawn from that point to the line E H. As the total normal pressure (N) of all the equal component vertical forces acting on the bed-joint A B may be represented by a single vertical force passing through the centre of the rectangle A B E H, it must also pass through the centre of the bed-joint C, so that C is the centre of pressure, and also the centre of the bed-joint.

If a similar section be now drawn to the same scale (Fig. 29) for the purpose of indicating graphically the same total normal pressure (N) on the bed-joint as in Fig. 30, but so distributed that a zero pressure shall be produced at B and uniformly increasing to a maximum pressure at A, this result may be obtained by constructing the triangle A B D so that A D in Fig. 29 = 2, A H in Fig. 30. Then the area of the pressure diagram A B D = area of pressure diagram A B E H (Figs. 29 and 30), and in each case represents the total normal pressure (N) on the bed-joint, whilst the length of the ordinate or vector at any point represents in magnitude the intensity of pressure on the bed-joint at that point. It will be observed that in both cases the mean normal pressure $\left(\frac{N}{t}\right)$ occurs at the centre of each bed-joint, for the intensity of pressure at the centre (K) in Fig. 29 is precisely the same as at C in Fig. 30, but the intensity of pressure at A in Fig. 29 is *twice* the intensity which would be obtained if the pressure were uniformly distributed over the bed, whilst at B no pressure is obtained. As the total normal pressure represented by the force diagram A B D is also equivalent to a single force (N) passing vertically through the centre of gravity of the triangle A B D at a distance of $\frac{1}{3}^{rd}$ A B from the point A, therefore the resultant force intersects the bed-joint at C, which is the "centre of pressure." Hence, no portion of a bed-joint is in tension when the total normal pressure is so distributed that the "centre of pressure" is not nearer to the outer edges of the bed than $\frac{1}{3}^{rd}$ the total width or thickness of the bed-joint. In other words, the "line of pressures" for any retaining wall must fall within the "*centre third*" of the wall's thickness so as to ensure that no tensile stress is brought upon any bed-joint.

Distribution of Pressure on Bed-joints.

It is necessary that a clear conception should be obtained of the nature and intensity of the stress to which the bed-joints of a structure may be subjected, so as to determine its power of resistance to overturning and crushing. For purposes of general investigation all bed-joints may be divided into two classes, viz.:—

A .. Uncemented bed-joints.
B .. Cemented bed-joints.

As a measure of ordinary prudence from an engineering stand-point, the bed-joints of retaining walls, masonry dams, etc., are regarded as possessing no tensile strength, so that the structure may provide adequate stability by reason of its inherent weight and form. Retaining walls of this description are therefore sometimes known as "gravity" walls. The bed-joints are then assumed to be "*uncemented*," the mortar or cementing material being merely considered as a convenient means of providing a proper bedding or seating for the blocks, and for filling any small interstices. To fulfil such conditions, it is essential for

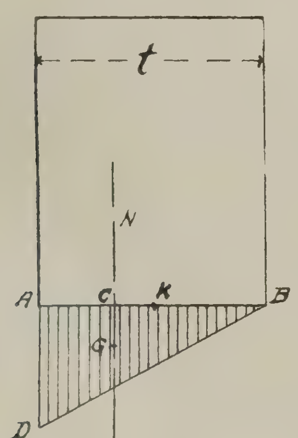


FIG. 29

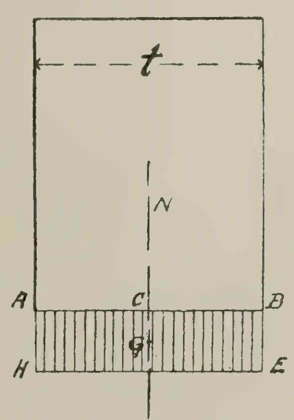


FIG. 30.

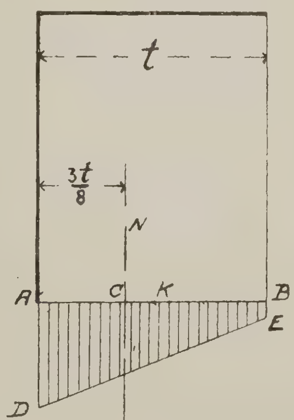


FIG. 31.

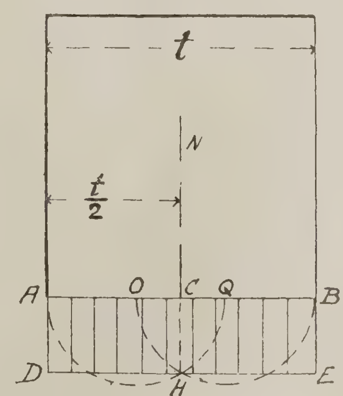


FIG. 32.

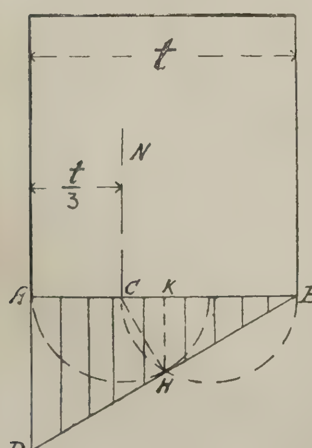


FIG. 33.

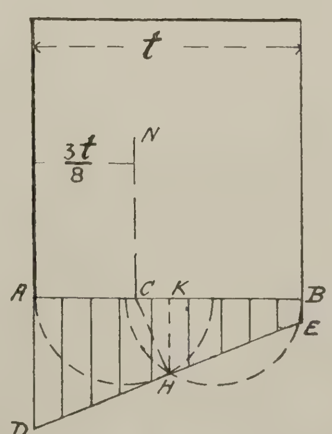


FIG. 34.

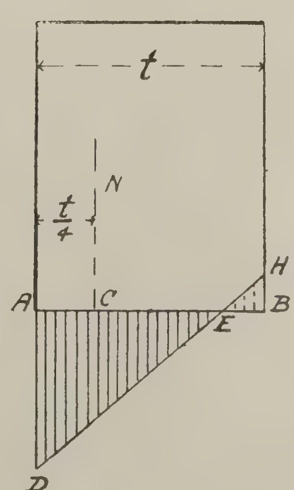


FIG. 35.

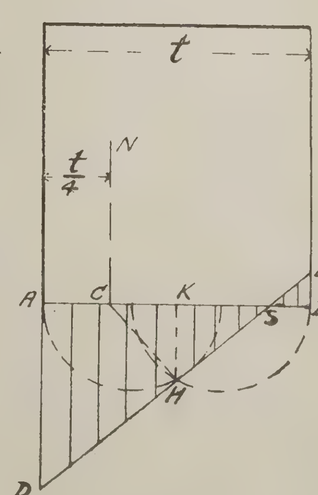


FIG. 36.

absolute safety that no part of any bed-joint shall be subject to a tensile stress.

Walls of an unimportant character, such as boundary walls, &c., are generally so constructed that the stability of the structure is to some extent dependent upon the tensile strength of the mortar joining the bricks or masonry, so that the whole may be capable of successfully resisting the pressure of wind or other external force. Such walls are then considered as having "*cemented bed-joints*," portions of which may be subject to tension within certain limits.

It has already been shown that when the centre of pressure occurs at the centre of the bed-joint, then the total normal pressure is equally distributed over the whole bed, the intensity being $\frac{N}{t}$ (Fig. 30). To ensure that there shall be no tension in any part of the bed-joint, it is necessary that the centre of pressure shall fall within the "*centre-third*" of the bed, the extreme limiting position from the centre being $\frac{t}{6}$, at which [point] there is a uniformly varying stress on the bed-joint, varying from zero to $\frac{2N}{t}$ (Fig. 29).

When the centre of pressure falls within the "middle-third" of a bed-joint, the maximum and minimum pressures borne at the outer edges of the bed (both for *uncemented* and *cemented* joints) may be conveniently ascertained by means of the following equations, viz. :—

$$\text{(I.) Maximum pressure} = \frac{2N}{t}\left(2 - \frac{3d}{t}\right)$$

$$\text{(II.) Minimum pressure} = \frac{2N}{t}\left(\frac{3d}{t} - 1\right)$$

where

N = total normal pressure on bed-joint.
t = thickness or width of bed-joint.
d = minimum distance of centre of pressure from outer edge of bed-joint.

The application of the foregoing formulæ shows that when the resultant normal pressure on the bed-joint passes through the *centre* of the joint, the total normal pressure is equally distributed throughout the joint, for $d = \frac{t}{2}$; then—

$$\text{Maximum pressure} = \frac{2N}{t}\left(2 - \frac{3d}{t}\right) = \frac{2N}{t}\left(2 - \frac{3}{2}\right) = \frac{N}{t}$$

$$\text{Minimum pressure} = \frac{2N}{t}\left(\frac{3d}{t} - 1\right) = \frac{2N}{t}\left(\frac{3}{2} - 1\right) = \frac{N}{t}$$

But $\frac{N}{t}$ = mean normal pressure when evenly distributed over the bed-joint (as indicated graphically in Fig. 30), so that the pressure is the same at both edges of the bed-joint.

Similarly, if $d = \frac{t}{3}$, then, substituting this value in the equations, we have

$$\text{Maximum pressure} = \frac{2N}{t}\left(2 - \frac{3d}{t}\right) = \frac{2N}{t}(2 - 1) = \frac{2N}{t}$$

$$\text{Minimum pressure} = \frac{2N}{t}\left(\frac{3d}{t} - 1\right) = \frac{2N}{t}(1 - 1) = \frac{2N}{t} \times 0 = \text{zero.}$$

The maximum pressure at the edge of the bed-joint nearest the centre of pressure is found to be equal to twice the mean normal pressure, whilst the minimum pressure at the opposite edge of the bed-joint is nil, as in Fig. 29.

When the centre of pressure occurs at any intermediate point between $\frac{t}{2}$ and $\frac{t}{3}$ from the outer edge, the maximum and minimum pressures are ascertained in the same manner. Let d — $\frac{3t}{8}$. Then

$$\text{Maximum pressure} = \frac{2N}{t}\left(2 - \frac{3d}{t}\right) = \frac{2N}{t}\, 2 - \frac{9}{8} = \frac{7N}{4t}$$

$$\text{Minimum pressure} = \frac{2N}{t}\left(\frac{3d}{t} - 1\right) = \frac{2N}{t}\left(\left(\frac{9}{8} - 1\right)\right) = \frac{N}{4t}$$

These pressures are indicated in Fig. 31, where A D = $1\frac{3}{4}$ and B E = $\frac{1}{4}$ the mean pressure at K.

Similar results may also be obtained by the graphic method of construction. A diagrammatic verification of the pressures which have been ascertained arithmetically in the foregoing examples will be found in Figs. 32 to 34.

Let A B, Fig. 32, represent the bed-joint, and N the total normal pressure acting at a distance of $\frac{t}{2}$ from the outer edge of the bed-joint.

Divide A B into 3 equal parts A O, O Q, and Q B. With O and Q as centres, and radius $\frac{t}{3}$ describe the semicircles A H Q and O H B, intersecting at H. Join the centre of pressure C and the intersection of the semicircles at H. Through H draw D H E at right angles to C H, meeting the vertical lines drawn from A and B at D and E. The diagram A B E D indicates the distribution of pressures. As D E is parallel to A B, therefore A D = B E = C H = $\frac{N}{t}$, and the normal pressure is evenly distributed over the whole bed-joint as in Fig. 30.

When the centre of pressure is at a distance of $\frac{t}{3}$ from the outer edge of the bed-joint, C being the centre of pressure, and K the centre of the bed-joint, then by the same process of graphic construction (Fig. 33) it will be found that zero pressure occurs at B, whilst K H = $\frac{N}{t}$ and A D = 2 K H = $\frac{2N}{t}$ (compare Fig. 29).

Similarly, when the centre of pressure is $\frac{3t}{8}$ from the outer edge of the bed-joint, (as in Fig. 34), it will be found that K H = $\frac{N}{t}$, and by scale A D = $1\frac{3}{4}$ K H = $\frac{7N}{4t}$ whilst B E = $\frac{1}{4}$ K = H $\frac{N}{4t}$. (Compare Fig. 31.)

Having investigated the general distribution of pressures for "*cemented*" and "*uncemented*" joints for cases where the centre of pressure falls within the "middle third" of the bed-joint, there remains to consider the variations which take place when it falls *outside* those limits.

With "*cemented bed-joints*" having the centre of pressure between the outer edge and $\frac{1}{3}$rd the width of the bed-joint, it is found that the total normal pressure will be distributed over a portion of the bed-joint, whilst the remaining portion will be subject to a tensile stress. When the resultant pressure falls *outside* the bed-joint, the structure may still remain stable, but the intensity of pressure on its outer edge is considerably increased, whilst the tensile stress at the opposite edge is also greater. In such cases the maximum and minimum pressures may be found arithmetically by the foregoing equations I and II, or by the graphic method already described.

Let $d = \frac{t}{4}$ (Fig. 35), then

$$\text{Maximum pressure} = \frac{2N}{t}\left(2 - \frac{3d}{t}\right) = \frac{2N}{t}\left(2 - \frac{3}{4}\right) = \frac{5N}{2t}$$

$$\text{Minimum pressure} = \frac{2N}{t}\left(\frac{3d}{t} - 1\right) = \frac{2N}{t}\left(\frac{3}{4} - 1\right) = -\frac{N}{2t}$$

Comparing these results it will be observed that when the centre of pressure falls within the thickness of the wall, outside the "middle third" of the bed-joint, then the maximum pressure at A continues to increase proportionately, whilst the equation for determining the minimum pressure results in a negative quantity, that is to say, a tensile stress is produced at B, as indicated by the pressure diagram in Fig. 35, the portion of the bed-joint A S, being in compression, whilst the remaining portion S B, is subject to a tensile stress. The graphic solution of the same example is also shown in Fig. 36.

When d = O, then

$$\text{Maximum pressure} = \frac{2N}{t}\left(2 - \frac{3d}{t}\right) = \frac{2N}{t}(2 - 0) = \frac{4N}{t}.$$

$$\text{Minimum pressure} = \frac{2N}{t}\left(\frac{3d}{t} - 1\right) = \frac{2N}{t}(0 - 1) = -\frac{2N}{t}.$$

The maximum compression at the outer edge of the bed-joint under these conditions is equal to 4 times the normal pressure, whilst the maximum tension at the opposite edge = twice the normal pressure. The same results are given by the graphic method, as indicated in Fig. 37.

When the centre of pressure falls *outside* the bed-joint it will be observed that d has a negative value, so that the minus sign in equations I. and II. changes to plus, the formulæ becoming modified as follows :—

$$\text{Maximum compression} = \frac{2N}{t}\left(2 + \frac{3d}{t}\right)$$

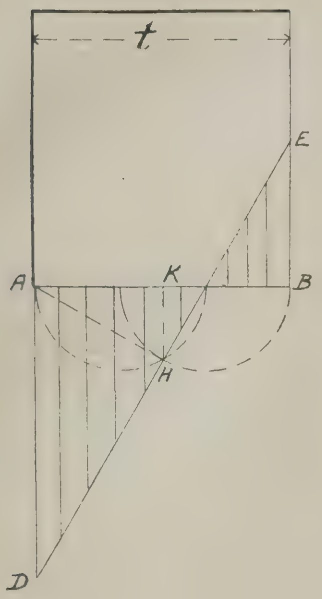


FIG. 37.

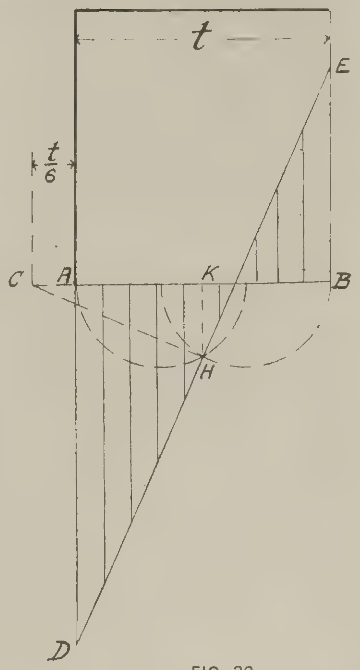


FIG 38.

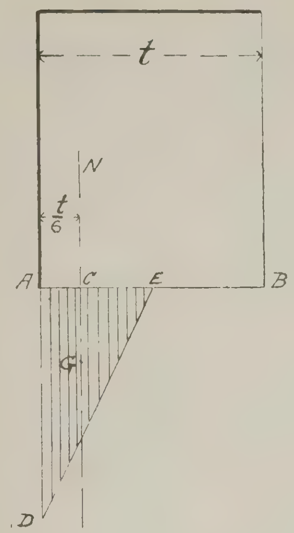


FIG. 39.

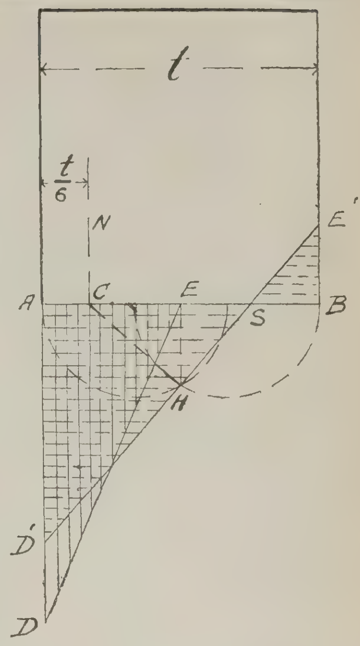


FIG. 40.

Maximum tension $= \frac{2\,N}{t}\left(\frac{3\,d}{t} + 1\right)$

For example, let the centre of pressure $= -\frac{t}{6}$ from the outer edge, then

$$\text{Maximum compression} = \frac{2\,N}{t}\left(2 + \frac{3\,d}{t}\right)$$

$$= \frac{2\,N}{t}\ (2 + \tfrac{1}{2})$$

$$= \frac{5\,N}{t}$$

$$\text{Maximum tension} = \frac{2\,N}{t}\left(\frac{3\,d}{t} + 1\right)$$

$$= \frac{2\,N}{t}\ (\tfrac{1}{2} + 1)$$

$$= \frac{3\,N}{t}$$

The graphic construction for the same conditions is shown in Fig. 38.

As compared with the previous example (Fig. 37), the maximum compressive and tensile stresses are both greatly intensified, so that the stability of the wall must depend entirely upon the tensile strength of the mortar at the back of the bed-joint and the resisting power of the material to crushing at the front edge of the bed-joint.

For walls with "*uncemented*" bed-joints, having the centre of pressure between the outer edge and one-third the width of the bed-joint, the total normal pressure on the bed becomes distributed over the outer portion of the bed-joint only, whilst the remainder of the joint merely tends to open and is subject to no stress of any kind.

Let the centre of pressure (C) on an *uncemented* bed-joint be nearer to the edge of the bed than $\frac{1}{3}$t, as A C, Fig. 39. From a theoretical consideration of these conditions it is found that the total normal pressure on the bed-joint is distributed over that portion of the bed A E, in which A E = 3A C, so the total length of bed-joint under pressure amounts to three times the distance of the centre of pressure from the outer face of the wall. The maximum intensity of pressure at A = twice the intensity which would be produced if evenly distributed over A E. The intensity of pressure becomes uniformly diminished from A until zero pressure is reached at E, the remaining portion of the bed-joint, E B, being under no pressure or stress, but having a tendency to open at this part of the joint.

When, therefore, the centre of pressure falls within the outer third of the wall's thickness, the maximum intensity of pressure occurs at the outer edge of the bed-joint A (Fig. 39), and is equal to twice the intensity that would be produced if evenly distributed over A E.

The maximum intensity at $A = \frac{2\,N}{3\,A\,C}$ where A C represents the distance of the centre of pressure from the outer face of the wall. The point of zero pressure in the bed-joint = 3 A C.

Should the centre of pressure occur at the outer edge of the bed-joint, the wall is in a condition of unstable equilibrium, and the maximum intensity of pressure is produced at the edge of an uncemented bed-joint. If the resultant pressure falls *outside* the bed-joint it is obvious that a wall of this description must overturn.

Fig. 40 illustrates the difference which occurs in the distribution of pressures upon a "*cemented*" and "*uncemented*" joint respectively, when the centre of pressure falls within the outer third of the wall. In each case the centre of pressure $= \frac{t}{6}$. The "*uncemented*" bed-joint has a maximum compression at $A = \frac{2\,N}{3\,A\,C} = 4$ times the mean normal pressure, if evenly distributed over the whole bed-joint, or twice the intensity of pressure if evenly distributed over A E. The pressure diminishes uniformly to the point E, where A E = 3 A C. the remaining portion of the joint E B being under no stress. With a "*cemented*" joint, the maximum compression at A = 3 times the mean normal pressure. The portion of the bed-joint A S is subject to compression, whilst the remaining portion S B is subject to a tensile stress. The maximum tension at B = the mean normal pressure. The neutral axis of the joint is at the point S, where there is neither compressive nor tensile stress.

When the maximum compressive and tensile stresses are known, the position of the neutral point (x) may be ascertained by means of the following equation :—

$$x = \frac{t}{1 + \frac{M}{m}}$$

where

x = distance of neutral point from edge of bed-joint.
t = thickness of width of bed-joint.
M = maximum compression on the bed-joint.
m = maximum tension on the bed-joint.

Summarising the ordinary conditions relating to the distribution of pressures on the bed-joints of structures, it is found that—

1. When the centre of pressure falls *within* the "middle third" of the bed-joint, the general distribution of pressure is the same both for cemented and uncemented bed-joints, and—other things being equal—the intensity of pressure at any point is the same in both cases.

2. When the centre of pressure falls *outside* the middle third, but *within* the outer third of the bed-joint, the distribution of pressure varies considerably for cemented and uncemented joints respectively. For cemented joints, having a tensile stress, the total normal pressure is distributed over a larger portion of the bed-joint than in uncemented bed-joints. As a result, the intensity of pressure on the portion of joint under compression is greater in an uncemented joint than in a cemented joint.

3. When the centre of pressure falls *outside* the bed-joint, then a wall with cemented joints may possess some measure of stability, provided the compressive resistance of the materials of which the wall is built and the tensile strength of the mortar are not exceeded. With uncemented joints, the wall must overturn.

All retaining walls should therefore be so designed that the centre of pressure on any bed-joint shall not be *nearer* the outer edge than one-third the thickness of the joint ($\frac{1}{3}$ t), as it is at this point that the extreme limit of deviation from the centre of the bed-joint has been reached in order to ensure that no portion of the bed-joint shall be subject to tension. In other words, the line of pressure, or line of resistance, must fall within the middle third of the wall's thickness.

(To be continued.)

CONTRACTORS' SECTION

(MONTHLY).

RAILWAYS AND THE BUILDING TRADE.—IV.

By **H. Morgan Veitch,** *solicitor to the Joint Railway and Parliamentary Committee of the "Perishables" Trades.*

(Concluded from p. 250, No. 684.)

Some Suggested Remedies.

The mere discussion of grievances, either in connection with railway affairs or otherwise, is of course futile unless one is prepared not only to suggest a remedy, but also to follow up proposals by energetic action. Unfortunately it is just in this respect that the British public is so often found wanting. Most traders are willing enough to exercise their inherited right of grumbling about their grievances, but, having gone so far, many of them are apt to feel that they have done all that can be expected of them, and that the actual "spade work" may well be left to others.

There is, however, a certain amount of excuse for this attitude in connection with railway matters, because, in the first place, the subject is a highly technical one; secondly, the public has no combined organisation as a whole similar to that which is enjoyed by the railway companies; and, thirdly, considerable difficulty is experienced by traders in crystallizing their grievances.

In this article, the concluding one of the series, the writer ventures to suggest, therefore, certain points on which traders might do well to concentrate their energies in pressing for reform.

Proof of Damage.

We have discussed in the preceding article the difficulty experienced by traders in enforcing payment of compensation where goods consigned at owner's risk are damaged by unreasonable treatment. The remedy proposed in this connection is two-fold. First, the railway companies should be made liable for damage caused by the "gross negligence" (as well as by the wilful misconduct) of their servants; this was, in fact, proposed by the Railway Contracts' Bill, which came to an untimely end in Parliament last year before reaching its third reading. Secondly, the burden of proof as to how damage arose should be shifted from the shoulders of the absent trader on to the railway company; in other words, instead of requiring the trader to prove how the damage was caused, the railway company should be liable to pay compensation, except in those cases where the company prove that such damage arose through some risk not undertaken by them.

Classification.

As previously explained, the present classification of goods, which was fixed pursuant to the directions contained in the Railway and Canal Traffic Act of 1888, is in many respects out of date, and owing to the altered conditions of trade many goods at present stand in a less favourable "class" than they deserve. The Board of Trade has at present no power to alter this classification; power, therefore, should be given to the Board to direct the transfer of an article into a more favourable class in cases where the trader can show that it is equitable for this to be done.

Increase of Rates.

As already stated, a rate cannot be raised above the amount at which it stood on December 31st, 1892, without the railway company being required to prove to the Railway and Canal Commissioners that such increase is reasonable. In attempting such justification the railway company should not be permitted to refer to events which happened before the date in question. Furthermore, where a rate is increased in respect of any particular article, the railway company should be required to show that the cost of working the particular traffic in respect of which such increase is made has itself increased.

Special Trial Rates.

Traders often contend, with considerable truth, that in many instances trade is being retarded by high rates, and that if lower rates were imposed an expansion of trade would result which would benefit the railway company as well as the trader. The writer, for one, would not fear a practical test of the truth of this contention, and he ventures to suggest that, with the previous consent of the Board of Trade, the railways should be empowered to try low experimental rates for a short definite period from time to time, with liberty to restore the rate to its former level if the traders' prophecy that the experimental rate would prove remunerative should fail to be justified. Obviously, the experimental rate would have to be for a fixed period, otherwise the railway companies might allege that every decrease of rate was merely by way of experiment, so that, in course of time, fixity of rates would altogether be abolished.

Cartage Rebates.

In practice the amount charged by the railway companies usually includes the cost not only of haulage by rail, but also of special services, such as cartage, etc. If, however, the trader does his own carting he is entitled to a rebate to cover the charge made by the railway companies for this item. It is remarkable how many small traders are ignorant of their rights in this respect, and unfortunately the railway companies do not enlighten them on the subject; indeed, unless the trader claims his rebate, the railway companies rarely refund the amount, and many thousands of pounds thus go into their pockets to which they are not legally entitled. As a matter of fact, even where the trader does obtain his rebate, he does not get all that he might fairly expect to receive, because it has been held that the railway company is only obliged to refund the actual *cost* of cartage, and in disintegrating a rate it is most difficult to prove what sum actually represents the true cost. Want of space prevents any detailed discussion of the recent case of *Pickfords, Ltd., v. the London and North Western Railway Co.*, but it may be explained that in this case two out of the three Railway and Canal Commissioners held (Sir James Woodhouse dissenting) that, in making a rebate for cartage services, *not* performed, a railway company could only be required to refund the actual cost saved to them by the trader, or his agent, doing the carting, and could not be required to refund the profit on such cartage which might be included in the total rate charged; in other words, the railway company may charge a profit in respect of a service which it has not performed! This decision was subsequently confirmed by the Court of Appeal, although the reasons given in the judgment were somewhat different from those put forward by the majority of the Commissioners as before stated.

Cost of Litigation.

The grievance under this heading is two-fold.

In the first place, if a railway company chooses to raise a rate, the trader must either submit or else he must take the case before the Railway and Canal Commissioners, and call upon the railway company to justify the increase. Whether he succeeds or not, he has to bear his own expenses, as no costs are allowed on either side, whatever may be the result. The expense of briefing eminent counsel, securing the attendance of competent witnesses, and instructing solicitors to get up the necessary evidence (often of a very detailed and complicated character) frequently runs well into four figures. The cost is thus felt very heavily by the trader, although the expense may represent comparatively a trifling item in the annual expenditure of a railway company.

Secondly, the trader is, in a similar way, placed at a great disadvantage if he seeks to recover in the ordinary Law Courts even a small claim for goods damaged in transit. For instance, where a claim amounts only to a few pounds, the trader commences his action in the county court; some technical point is raised on behalf of the railway company, on the strength of which, if they lose in the first instance, they carry the case on appeal from court to court, until the House of Lords is reached, with the result that the trader finds almost at the outset that he must either abandon the litigation and make such terms with his adversaries as best he can (possibly paying their costs to date in addition to his own), or else run the risk of finding the House of Lords against him, with the result that he stands to lose possibly some thousands of pounds over a claim which in the first instance may not have amounted to as many shillings, or even pence. The result is that justice is, in effect, often denied where litigation arises between the public and the railway companies. The writer ventures to suggest, therefore, that in small cases, say, where the amount in dispute is under £20, neither side should have the right to appeal from the decision of a county court judge, whose decision between the parties would be final. It is submitted that for all practical purposes the county court judge (either with or without a jury) should be quite competent to deal finally with all questions of law as well as of fact in connection with so small a sum, and both sides would be saved the expense of inordinate litigation. No dangerous precedent would be created for future use, either for or against a railway company, because the decisions of a county court

judge are not binding on the judge of any other court. Of course, cases sometimes arise in which it is very desirable for the railway companies to obtain the decision of the highest tribunal in the land. In this event they would select, as a test case, some suit in which the subject matter in dispute was at least over £20. It may be suggested that sometimes the nominal sum at stake in a test case is quite small, and that both parties are often desirous of carrying the matter to the House of Lords. This difficulty might easily be overcome by providing that an appeal to the higher court shall be permitted where the subject matter in dispute is less than £20, provided both parties sign a written agreement to that effect at the commencement of the proceedings in the court of first instance.

There are, of course, many other amendments of the law which it is urgently desirable to carry into effect, especially those which would restore to the mercantile community those privileges which successive Acts of Parliament have intended to confer on them, but which have been whittled away by various judicial decisions—often obtained as the result of pertinacious appeals by the railway companies at a cost which traders could not attempt on their side to incur. These, however, represent a more technical branch of the subject, and detailed explanation would be out of place here.

Summary of the Position.

Summing up the whole position, the writer submits that traders should avail themselves of the present political situation to crystallize their grievances and to concentrate their efforts on obtaining amelioration of their position, pressing especially for the following reforms: (1) Proof of how damage to goods has arisen to be borne by the railway company; (2) the company's liability under owner's risk to include cases of gross negligence; (3) power for Board of Trade to amend existing classification; (4) special trial rates to be encouraged; (5) limitation of the points to be considered in justifying the raising of a rate; (6) expensive litigation to be checked as suggested above.

Those interested in the subject may be glad to know that the Joint Railway and Parliamentary Committee of the "Perishables" trades has recently submitted to Mr. Lloyd George for his approval a Bill intended to deal with most of the above grievances, as they affect the interests of traders in general, feeling that any amendment of the existing law must have the support of the public as a whole, and must not attempt to ameliorate the position of any one section alone.

It remains to be seen whether the Government, if approving the provisions of this Bill, will be prepared either to bring it forward as a Government measure or to support it if brought forward by a private member—or, even better, to incorporate the clauses in a still more comprehensive Bill.

Meanwhile, those who are in favour of the principles thus advocated could lend valuable aid by bringing the matter to the notice of their respective Chambers of Commerce, as well as of their members of Parliament.

In conclusion, the writer desires to express his indebtedness to those correspondents who have taken the trouble to forward to the Editor of this journal actual instances of their grievances. These letters, together with any further correspondence on the points raised by the present article, will be carefully preserved, and (although anonymity will be respected in cases where this is desired) the instances given will be most useful by way of illustration when the matter comes up for discussion in Parliament on the conclusion of the present railway conference at the Board of Trade.

UNDERPINNING AND THE DEFLECTION OF GIRDERS.

It is useful to record any innovations made in engineering practice, and we are always glad to receive information of such a nature. Novel methods often result in practice. They may apply only to small things, and the circumstances may be very different from ordinary practice, so that perhaps the same conditions may never arise again; nevertheless, anything is valuable which adds to our general knowledge as regards ways and means of overcoming difficulties. It is only by experience gained in such practical matters that theory is enabled to advance.

In the present article we record two novel methods of underpinning that may be of some general utility. There is no need for us to describe the conditions exactly, nor the places where the work was carried out, as that is really of no interest, and the work, as a matter of fact, was carried out out some years ago; it is the principles only that need concern us.

The methods we record were adopted by Mr. Michael Brophy (principal of Messrs. James Slater and Co., Ltd., the well-known domestic engineering specialists of High Holborn, London, W.C.), who, since the work was carried out, has been responsible for many valuable inventions.

In carrying out some alterations to a house it was desired to throw two rooms into one, and it was found that a bressummer would be needed to carry the wall on the first floor, as the supporting wall below was to be removed. This wall had settled and at the first-floor level was badly cracked, as shown by the wallpaper being very much twisted and puckered in places.

The ordinary method of underpinning would have been to insert needles to carry the wall above, and to push a plate-girder into place, packing up with slates and pieces of brick wedged in from the sides. The interior of the packing would have been looser than the outsides, and

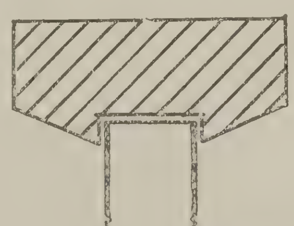


FIG. 1.

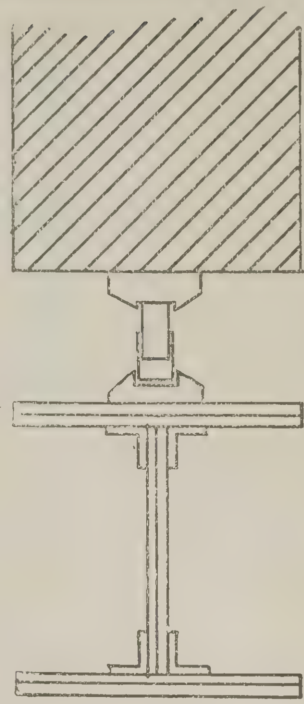


FIG. 2.

thus the weight of the wall would really have been carried upon the two outer faces, instead of evenly bearing on the girder throughout the width; in fact, it would have been better, if it were possible under the ordinary method, to make the packing tightest in the middle; but as it has to be wedged in from the sides, this was impossible. Moreover, when the needles were removed and the weight came on the girder, this must have deflected, with the result that the cracks in the wall above would have been still further enlarged. Mr. Brophy, however, thought of a method which certainly seems to offer decided advantages over the ordinary method of underpinning, and was in this particular instance even decidedly better. He took some ordinary pieces of steel tube, threaded one in the other, and placed them in cast-iron sockets. (Fig. 1 clearly shows this arrangement in section.) These small screwjacks were placed about 1ft. apart across the whole width of the plate-girder, in the manner shown in Fig. 2. A workman with an ordinary pipe-wrench then gradually tightened these up one by one across the span, so that the wall had a thorough bearing upon the girder, until the latter took its deflection. Eventually the wall was forced back into its proper position, and the cracks were closed, as was clearly shown from the fact that the paper on the wall was straightened out and made smooth again, all the puckers being taken out of it. It was now simple to brick up between the small screw-jacks, which could then be removed, and the remaining spaces which they had occupied finally bricked up also.

Such a method of underpinning might well be adopted in many other cases.

The Second Example.

The other interesting example to which we would refer is the case of a girder which had been placed between two walls to support one wall of a small back addition. By some mistake on the part of the builder, a strut had been placed under the girder at the outer extremity of this addition, as shown at A in Fig. 3. This stiffened the girder and prevented it taking its normal deflection under the load,

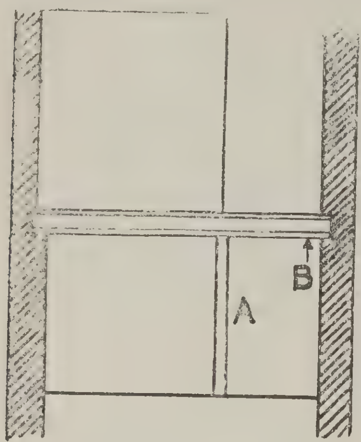


FIG. 3.

the load consisting of the weight of the addition. When this latter had been built, it was found that the prop A could not be knocked away without exerting much force, and that if it were removed the girder would deflect and crack the addition above. It now occurred to Mr. Brophy that by cutting out the brickwork just above the girder at one end, and placing a screw-jack under that end (namely, at the point B shown in Fig. 3), this end of the girder could be raised until a small amount, equivalent to the amount of deflection it should have taken under the load, could be removed, so as to take the weight of the strut A. This was done, and when the right-hand end of the girder had been raised sufficiently it was found that the prop could be removed easily by just knocking it aside. The template under the girder was now raised and bricked up to the right height. By this means any cracking of the back addition was prevented.

This instance is somewhat out of the ordinary run, and perhaps may seldom occur again, but the principle is one which it is valuable to bear in mind.

MODERN JOINERY.

When reviewing former editions of Mr. George Ellis's "Modern Practical Joinery," we have pointed out what an excellent book it is, and our good opinion is enhanced on examination of the third edition, now before us. With a technical volume of this character, the great difficulty is to combine the practical knowledge of the craftsman with the comparative knowledge and facile expression of the practised instructor. Mr. Ellis, however, is happy in this two-fold acquirement, and his book, consequently, is of real value. He has dealt with the subject in a very thorough manner from start to finish, and while the fullest information is given in the preliminary stages, the book is carried on progressively throughout, and embodies the latest practice in joinery. Text-books frequently suffer from not being sufficiently up-to-date, their authors having, perhaps, first served a practical course, then turned into instructors, and, as such, have failed to keep themselves abreast of the times. No such deficiency is to be found in this book. In the third edition many new features have been added—in particular several chapters dealing with the preparation of joinery by machinery, which is increasing rapidly, and is the practice that will be followed more and more as time goes on. Various additions have been made to the chapters on door frames, windows, shop-fronts, and miscellaneous fittings (chiefly in the form of further plates of modern examples), and the glossary and index have been considerably enlarged. On this page we reproduce some details of improved methods of constructing weather-proof sash and casement windows by means of checks easily and economically applied, and forming part of the construction; this serves as a type of the illustrations given in the volume, and is of much interest.

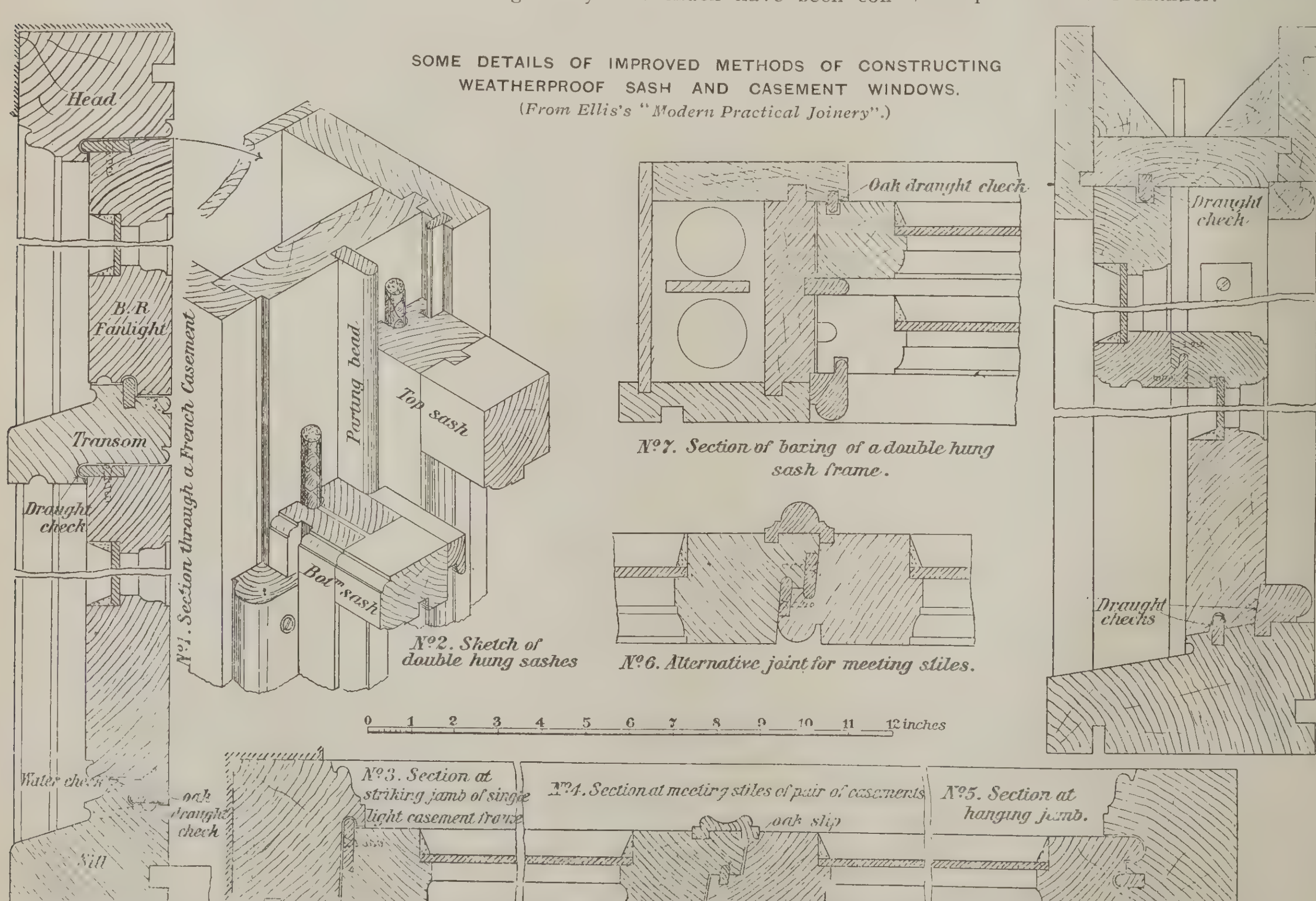
We can thoroughly recommend this book as the best modern work on joinery. It is clearly written, very fully and excellently illustrated, and produced in the best possible manner.

"Modern Practical Joinery," by George Ellis, vice-president of the British Institute of Certified Carpenters, Lecturer on Carpentry and Joinery and Hand-Railing at the London County Council School of Building. Third edition. B. T. Batsford, 94, High Holborn, W.C.: price 15s. net.

THE DEMOLITION OF NO. 1, BRICK COURT, TEMPLE.—The tenants of No. 1, Brick Court, Middle Temple, have now all left their chambers. The old oak panels, marble mantelpieces, and the various other fittings and materials will at once be sold by auction, and directly after the sale the building will be pulled down in order that the work of rebuilding may be proceeded with without delay.

A FINE ARCHWAY is now in course of construction over Charles Street, Whitehall, connecting the new building of the Local Government Board with the Home Office. It is richly embellished with sculpture, and, if the original design is carried out, will be surmounted by a quadriga. Parliamentary sanction is being sought to erect an arch of similar character across Downing Street, connecting the Home Office and the Colonial Office with the older buildings of the Privy Council. There is, however, no immediate probability of the design being completed in this manner.

SOME DETAILS OF IMPROVED METHODS OF CONSTRUCTING WEATHERPROOF SASH AND CASEMENT WINDOWS.
(*From Ellis's "Modern Practical Joinery".*)



Current Market Rates of Materials in the Various Trades.

The quotations given in this list apply only to larger quantities purchased in London (the minimum quantity for which these prices are applicable being given where practicable). Retail purchasers must expect to pay a reasonable advance on wholesale rates, as well as carriage. The trade discounts for each item have not been considered, as these would be affected by the quantity of the goods purchased. The market rates one month ago for those materials which are subject to any appreciable fluctuations are also given, for purposes of comparison, and as indicating a rise or fall in prices.

BRICKLAYER.

The current rates for stocks, Flettons, and other common building bricks, and for local facings are not given, as local considerations obviously affect their prices, and readers who may make use of the information given in these columns can readily obtain quotations for themselves.

		Curren rates.	Rates for similar materials on March 1.
Best blue pressed Staffordshire bricks	per 1,000	3 5 0	3 10 0
do. bullnose bricks	do.	3 15 0	4 0 0
Best Stourbridge fire bricks	do.	4 15 0	

Glazed Bricks.

(*NOTE.—The prices given at per brick are on rail at works; for the price at a London railway station, carriage at the rate of £2 per 1,000 must be added.*)

		Curren rates.	Rates for similar materials on March 1.
Best white and ivory white glazed one side	per 1,000	10 10 0	9 0 0
do. glazed one end	do.	9 15 0	8 5 0
do. quoins, bullnose bricks, and bricks glazed on 4½in. side	do.	14 0 0	12 10 0
do. glazed two sides (double stretchers)	do.	15 0 0	14 15 0
do. glazed two ends (double headers)	do.	13 0 0	12 10 0
do. glazed one side and two ends	do.	15 0 0	14 15 0
do. glazed two sides and one end	do.	15 10 0	
Splays, chamfers, and squints (to an angle of 45 degs.)	do.	15 10 0	
Double bullnose bricks, double splays, round ends, bullnose stops, and mitres	each	0 0 4½	
Double bullnosed mitres ...	do.	0 0 7	
Internal angles, 2¼in. radius	do.	0 0 4½	
do. do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Best buff-cream	per 1,000	12 0 0	
do. glazed one end	do.	11 0 0	
Other colours, extra ...	do.	4 0 0	
do. quoins, bullnoses, and bricks, glazed on 4½in. sides*	do.	16 0 0	
do. glazed two sides (double stretchers)*	do.	19 0 0	
do. glazed two ends (double headers)*	do.	16 0 0	
do. glazed one side and two ends*	do.	19 0 0	
*These bricks in other colours, extra	do.	3 0 0	
do. glazed two sides and one end	do.	20 0 0	
Splays, chamfers, and squints for an angle of 45 degs	do.	20 0 0	
In other colours, extra ...	do.	3 0 0	
Internal angles, 2¼in. radius	each	0 0 6	
do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Ordinary-quality salt-glazed bricks, glazed one side ...	per 1,000	9 0 0	8 0 0
do. glazed one end	do.	8 5 0	7 5 0
do. quoins, bullnoses and bricks, glazed on 4½in. sides	do.	12 10 0	10 10 0
do. glazed two sides (double stretchers)	do.	13 10 0	12 15
do. glazed two ends (double headers)	do.	11 10 0	10 10
do. glazed one side and two ends	do.	13 10 0	12 15
do. glazed two sides and one end	do.	14 0 0	13 10
do. splays, chamfers, and squints for an angle of 45 degs.	do.	14 0 0	13 10
Specially prepared or dipped salt-glazed with plain glazed side or ends, as described above, same price as for best ivory whites	per 1,000		
Ordinary-quality salt-glazed double bullnoses, double splays, round ends, bullnosed stops and mitres	each	0 0 4	
Best dipped salt-glazed do.	do.	0 0 4½	
Ordinary salt-glazed double bullnosed mitres	do.	0 0 6	
Best dipped salt-glazed do.	do.	0 0 7	
Ordinary salt-glazed internal angles, 2¼in. radius	do.	0 0 4½	
do. 4½in. radius	do.	0 0 5	
Best dipped salt-glazed internal angles, 2¼in. radius	do.	0 0 4½	
do. 4½in. radius	do.	0 0 8	
Ordinary salt-glazed moulded bricks (stretchers and headers)	do.	0 0 4	
Best dipped do.	do.	0 0 6	
Second-quality glazed white and ivory white, 35s. per 1,000 less than best white			
Second-quality coloured bricks, same price as best whites of their respective descriptions			
Plain arch bricks £4 per 1,000 above list for respective kinds and colours			
Cambered arch bricks 1s. each, any kind or colour, if not exceeding 9ins. by 4½ins. by 3½ins.			
Rich majolica glazed bricks (headers and stretchers)	per 1,000	24 0 0	
do. quoins and bullnoses ...	do.	27 0 0	

Sand, Ballast, Cement, Lime, and Fireclay.

Thames and pit sand ...	per yard	0 7 0	
Thames ballast	do.	0 5 6	0 5 0
Best Portland cement ...	per cask	0 5 10	
Best ground blue lias lime	per ton	0 19 0	
(NOTE.—The charge for the sacks to be added to prices per ton.)			
Grey stone lime	per yard	0 11 6	
Stourbridge fireclay in sacks	per ton	0 27 6	upwards

MASON, SLATER AND TILER.

The average current prices for stone per foot cube are given in the following list, the railway rates being calculated on the assumption that orders will be given for full truck loads of about 4 tons upwards.

Brown Whitbed Portland stone (in blocks containing on an average 20 ft. cube)	per ft. cube	0 2	
White Basebed do.	do.	0 2 2	
Bath stone	do.	0 1 7	
Beer stone	do.	0 1 6	
Ancaster stone	do.	0 1 10	
Greenshill stone	do.	0 1 10	
Chilmark stone	do.	0 1 9	
Darley Dale stone	do.	0 2 3	upwards
Red Mansfield stone	do.	0 2 4	
Closeburn red freestone ...	do.	0 2 0	
Hard York stone	do.	0 2 10	
do. 6 in. sawn both sides landings (random sizes)	per ft. super	0 2 4	
do. 6 ins. rubbed two sides do.	do.	0 2 7	
do. 3 ins. sawn two sides slabs	do.	0 1 0	
do. 2 ins. self-faced random slabs	do.	0 0 6	
Broken granite 1½ in. gauge	per yard	0 14 0	
do. do. 2 in. gauge	do.	0 14 6	
do. do. 2½ in. gauge	do.	0 13 7	
Norwegian granite kerb, 6ins. by. 12 ins. and 12 ins. by 6 ins.	per ft.	0 1 7	
do. circular	do.	0 1 10	
do. 12 ins. by 8 ins.	do.	0 1 10	
do. circular	do.	0 2 1	
Aberdeen pitchings, 3 ins by 6 ins.	per yard super	0 14 6	
do. 3 ins. by 7 ins.	do.	0 15 9	
do. 4 ins. by 6 ins.	do.	0 13 3	

Slates.

*Best blue Bangor Countess slates	per 1,000 of 1,200	13 0 0	upwards
do. 20 ins. by 12 ins.	do.	13 15 0	
First-quality Bangor Countess slates	do.	12 17 6	
do. 20 ins. by 12 ins.	do.	13 10 0	
do. Ladies	do.	7 5 0	
Permanent green Countess slates	do.	11 10 0	upwards
do. 18 ins. by 10 ins. ...	do.	9 10 0	
do. Ladies	do.	6 10 0	
Best "Eureka" unfading green Countess slates ...	do.	15 15 0	
do. 20 ins. by 12 ins. ...	do.	18 7 6	
do. 18 ins. by 10 ins. ...	do.	13 5 0	
do. Ladies	do.	10 5 0	
Best blue Portmadoc Countess slates	do.	11 10 0	
do. Ladies	do.	6 10 0	

**These prices are for lots not less than 4 tons.*

Tiles.

Plain red roofing tiles ...	per 1,000	2 2 0	
do. hip and valley tiles ...	per doz.	0 3 6	
Best Broseley tiles	per 1,000	2 10 0	
do. ornamental tiles	do.	2 15 0	
do. hips and valley tiles ...	per doz.	0 3 10	
Edwards's (Ruabon) brindled red or brown tiles ...	per 1,000	2 17 0	
do. ornamental do.	do.	3 0 0	
Valley tiles	per doz.	0 3 9	
Hip tiles	per doz.	0 4 0	
Peake's mottled or red Staffordshire tiles	per 1,000	2 12 0	
do. ornamental do.	do.	2 15 0	
Valley tiles	per doz.	0 3 6	
Hip tiles	do.	0 4 0	
Best "Rosemary" plain tiles	per 1,000	2 5 0	
do. ornamental do.	do.	2 8 0	
Valley tiles	per doz.	0 3 7	
Hip tiles	do.	0 4 0	
"Hartshill" sand-faced tiles	per 1,000	2 10 0	
do. pressed do.	do.	2 5 0	
do. ornamental	do.	2 12 6	
Valley tiles	per doz.	0 3 5	
Hip tiles	do.	0 3 11	

CARPENTER AND JOINER.

Fir timber best middling Danzic or Memel.	per load	4 15 0	
Seconds	do.	4 10 0	
Small timbers (8 ins. to 10 ins.)	do.	3 15 0	
do. (6 ins. to 8 ins.)	do.	3 10 0	
Swedish Balks	do.	3 0 0	
Pitch-pine (average 30 ft.)	do.	4 5 0	
Deals best 3 ins. by 11 ins., 4 ins. by 11 ins., and 4 ins. by 9 ins.	per standard	14 10 0	
For deals 3 ins. by 9 ins. deduct	do.	1 0 0	
For deals seconds deduct...	do.	1 5 0	
Battens, best, 2½ ins. by 7 ins., 2½ ins. by 8 ins., 3 ins. by 7 ins., and 3 ins. by 8 ins.	do.	12 0 0	
For battens 2½ ins. by 6 ins. and 3 ins. by 6 ins. deduct		0 10 0	
For battens seconds deduct from best	do.	0 15 0	
Battens 2 ins. by 4 ins. and 2 ins. by 6 ins.	do.	9 10 0	
do. 2 ins. by 4½ ins. and 2 ins. by 5 ins.	do.	9 0 0	
For foreign sawn boards 1 in. by 7 ins. and 1¼ ins. by 7 ins. add to price of battens	do.	0 10 0	
For ¾ in. do. add	do.	1 0 0	
White Sea first yellow deals 3 ins. by 11 ins. (average price)	do.	24 0 0	
For 3 ins. by 9 ins. deduct	do.	2 0 0	
Second yellow deals 3 ins. by 11 ins.	do.	19 0 0	
For 3 ins. by 9 ins. deduct	do.	1 0 0	
Third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	13 10 0	
White Sea first yellow battens 2½ ins. by 7 ins. and 3 ins. by 7 ins.	do.	17 0 0	
Second do.	do.	13 10 0	
Third do.	do.	11 10 0	
Petersburg first yellow deals 3 ins. by 11 ins.	do.	21 10 0	
For 3 ins. by 9 in. deduct from above	do.	3 0 0	
do. second yellow deals 3 ins. by 11 ins.	do.	16 0 0	
For 3 ins. by 9 ins. deduct	do.	1 0 0	
do. third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	13 0 0	
Petersburg battens, first...	do.	14 0 0	
do., second	do.	11 10 0	
do. third	do.	10 10 0	
White Sea and Petersburg, first white deals, 3 ins by 11 ins.	do.	14 10 0	
For 3 ins. by 9ins. deduct from above	do.	1 0 0	
do., second white deals 3 ins. by 11 ins.	do.	13 10 0	
For 3 ins. by 9 ins., deduct from above	do.	1 0 0	
do., first white battens ...	do.	11 0 0	
do., second do.	do.	10 0 0	
Pitch-pine deals	do.	19 0 0	
Add for less than 2 ins. thick	do.	0 10 0	
First yellow pine regular sizes	do.	44 0 0	
do., oddments	do.	32 0 0	
Second yellow pine regular sizes	do.	33 0 0	
do., oddments	do.	28 0 0	
American whitewood planks	per ft. cube.	0 4 6	
Kauri pine planks	do.	0 4 0	
1 in. by. 7 ins. yellow flooring, planed and shot ...	per square	0 14 0	
Add, if matched	do.	0 0 6	
1¼ in. by 7 ins. yellow, planed and matched ...	do.	0 16 6	
1 in. by 7 ins., white planed and shot	do.	0 12 6	

1 in. by 7 ins., white, planed and matched ...	per square	0 13 0	
1¼ in. by 7 ins., do.	do.	0 15 6	
¾ in. by 7 ins., yellow matched boarding, beaded or V-jointed	do.	0 11 6	
1 in. by 7 in., do.	do.	0 15 0	
¾ in. by 7 ins., white do. ...	do.	0 10 0	
1 in. by 7 ins. do.	do.	0 13 0	
For 6 ins. boards deduct from the above prices ...	do.	0 6 0	

Hardwoods.

Teak	per load	18 0 0	
Danzig and Stettin oak logs (large)	per ft. cubs	0 3 0	
do., small	do.	0 2 6	
Wainscot oak logs	do.	0 5 9	
Dry wainscot oak (in the 1 in.)	per ft. super	0 0 9	
¾ in. do., do.	do.	0 0 7	
Dry Honduras mahogany (Tabasco), in the 1 in. ...	do.	0 0 10	
do., selected Figury do. ...	do.	0 1 8	upwards.
do., American walnut do....	do.	0 0 10	

FOUNDER AND SMITH.

Cast-iron columns and stanchions, including patterns	per ton	7 10 0	
do., drain pipes, 3 ins. diameter, L.C.C. weights, in 9 ft. lengths, coated with solution	per yard	0 2 4	
do., do., 4 ins. diameter ...	do.	0 3 0	
do., do., 5 ins., do.	do	0 3 10	
do, do., 6 ins., do.	do.	0 4 6	
do., do., 9 ins., do.	do.	0 6 3	
Rolled steel joists, Belgian (ordinary section)	per ton	5 10 0	
do., English	do.	7 0 0	
Rolled steel fencing wire...	do.	7 0 0	
do., galvanised	do.	9 0 0	
Steel compound girders (ordinary section)	do.	9 5 0	
Angles, channels, etc., do.	do.	9 5 0	
Galvanised sheets, common brands	do.	13 10 0	
Wrought-iron gas tubes (current discount off standard lists)	p.c.	65 p.c.	67 %
do., water tubes	do.	62½ p.c.	
do., steam tubes	do.	57½ p.c	
do., galvanised gas tubes...	do.	52½ p.c.	55 %
do., do., water tubes ...	do.	50 p.c.	
do., do., steam tubes ...	do.	45 p.c.	
Expanded metal lathing, ⅜ in. mesh (short way) 24 gauge, in quantities of not less than 300 yds. ...	per yard	0 0 10	
do., 22 gauge	do.	0 1 3½	
do., 20 gauge	do.	0 1 5½	
do., ¼ in. mesh, 24 gauge...	do.	0 0 10½	
do., 22 gauge	do.	0 1 4½	
do., 20 gauge	do.	0 1 6½	

(*For quantities of between* 300 *and* 700 *yds. deduct approximately* 10 *per cent. from above; for quantities of between* 700 *to* 1,400 *yds., deduct approximately* 15 *per cent.*)

PLUMBER, COPPERSMITH, AND GLAZIER.

Sheet lead, 3 lbs.	per ton	18 2 6	Approximately 10/- per ton less.
do., above 3 lbs.	do.	17 12 6	
Lead water pipe up to 2 ins. diameter	do.	18 2 6	
Lead barrel pipe	do.	19 2 6	,,
Lead pipe, tinned inside ...	do.	15 0 0	
do., and washed outside ...	do.	17 10 0	,,
do., soil pipe, up to 4½ ins.	do.	21 2 6	,,
do., do., to 6 ins.	do.	2 2 6	,,
do., do., above	do.	2 17 6	,,
Lead sash weights	do.	0 12 6	,,
Sheet zinc	do.	28 0 0	upwards.
Copper sheets	do.	78 0 0	
do., nails	per lb.	0 0 10	
do., wire	do.	0 0 10	
Plumber's solder	per ton	65 0 0	
Tinman's solder	do.	80 0 0	
Old lead (against account, etc.)	do.	13 7 6	12 15 0
Clean scrap brass, do. ...	do.	2 2 0	
Clean scrap copper, do. ...	do.	2 14 0	
Old zinc, do.	do.	0 16 0	
15 oz. English sheet glass, thirds (in crates)	per foot	0 0 2¼	
do., do., fourths	do.	0 0 1¾	
21 oz. do., do., thirds ...	do.	0 0 3¼	
do., do., fourths	do.	0 0 2½	
26 oz., do., do., thirds ...	do.	0 0 .	
do., do., fourths	do.	0 0 3½	
32 oz., do., do., thirds ...	do.	0 0 5	
do., do., fourths	do.	0 0 4½	
For obscured sheet glass add to fourths	do.	0 0 1	
15 oz. fluted sheet	do.	0 0 3¼	
21 oz., do., do.	do.	0 0 4¼	
For obscured fluted sheet, add to above	do.	0 0 1	
⅛ in. plain rolled plate ...	do.	0 0 2¼	
3-16 in., do., do.	do.	0 0 2½	
¼ in. do., do.	do.	0 0 3	
For rolled fluted plate add to the above prices ...	do.	0 0 7	

THE PORTLAND CEMENT TRADE.

The month of March has shown an increased activity in the demand for cement for consumption in the United Kingdom, and the drop in freight rates to foreign markets has made it possible once more to resume shipments to the Pacific Coast of North America, notwithstanding the growth of the local production and the invasion of that market by manufacturers from the United States. This is an encouraging feature, as it tends to show that British cement may continue in demand there for some time longer.

The steady recovery of the United States from the paralysis brought about by the unprecedented financial crisis of last autumn has not only improved business in that country, but by terminating the American demand for gold has led to that reduction in the London Bank rate which was so needed for the prosecution of those great undertakings, which are always large consumers of cement and other constructional materials. The high price of money has for a long time past made it difficult for municipalities and other public bodies to embark upon schemes involving large expenditure, and the marked diminution in this class of work has exercised a very depressing effect upon the building trade during the past two years. Now that the Bank rate has dropped to 3 per cent.—a lower level than we have seen it for more than two years past—it may be expected that many large schemes of public utility or improvement will be brought forward for consideration, and thereby tend to that revival in the building trade which is so ardently desired.

The demand for the East continues good, and although the date for sending in tenders for the 4½ million casks of cement required for the Panama Canal has been postponed until April 13th the construction of that great waterway must ere long exercise a stiffening influence on cement prices.

The use of reinforced concrete continues to spread, and greater attention is being directed to its advantages. We hear on good authority that the newly-formed Concrete Institute—on the lines of the Iron and Steel Institute—is progressing satisfactorily, and that the project is receiving influential support.

Whilst the accumulation of stocks at British cement works has undoubtedly been heavier than usual during this winter, and a downward tendency in prices has consequently manifested itself, these are signs of a revival, and as manufacturers are feeling the effects of the higher prices of fuel, it is certain that they will make a very strong effort to secure better figures as soon as the weather permits the normal increase in building activity to take place..

Both in Germany and Belgium the prospects of the building trade for 1908 are very good, and it is unlikely therefore that the continued falling off of the imports of foreign cement into the United Kingdom will be arrested by a decreased demand for Belgian and German cements in their own countries. A comparison of the Customs figures of cement imports for the first two months of 1908 with those for the corresponding period of 1907 shows the same downward tendency—the total being only 13,521 tons this year as against 15,193 a year ago. This is satisfactory for two reasons—firstly, because it indicates that greater attention is being paid to quality and to the great difference which exists between the genuine artificial Portland cement which is alone produced in Great Britain, and that of the material which, known in the trade as "Natural Cement," and emanating from Belgium, almost exclusively constitutes the supply of "Foreign" in Great Britain: and, secondly, because it affords evidence of the determination of British cement manufacturers to avail themselves of every improvement which conduces to a high standard of quality and a low cost of production, thereby bringing the selling price of the home article down to a sufficiently competitive basis. Indeed, progress in this direction has been very marked during the last year or two, and, as various professional bodies have had personal opportunities of seeing for themselves, the chief cement works in this country are now equipped with machinery and appliances undreamed of a few years ago, and unsurpassed in any other lands.

Side by side with this improvement in the actual machinery of production, there has fortunately been an equal improvement in the methods of scientific control of that machinery. The various processes are no longer guided by rule of thumb, but by trained chemists, and the combined labours of the engineer and the chemist have given us to-day a product which surpasses that of a few years ago in fineness, in soundness, and in strength. It now remains only for the architect and the civil engineer to avail themselves to the full of the advantages which the newer material places ready to their hands.

Portland Cement Manufacture in Canada

The "Financier and Bullionist" publishes the following in regard to Portland cement manufacture in Canada during the past year:—

"The total quantity of cement made in the fifteen plants from which returns were received was 2,413,513 barrels, as compared with a total of 2,152,562 barrels made in 1906, showing an increase of 260,951 barrels, or over 12 per cent. The total sales were 2,368,593 barrels, as compared with 2,119,764 barrels in 1906, an increase of 248,829 barrels, or over 11 per cent. The total daily capacity of the fifteen companies making returns was about 12,400 barrels, the other two companies having a daily capacity of 1,900 barrels, making a total capacity of 14,300 barrels per day. These companies are distributed as follows:—One in Nova Scotia, one in Quebec, thirteen in Ontario, one in Alberta, and one in British Columbia. At least six other plants were in course of construction with a total proposed daily capacity of from 10,000 to 12,000 barrels. Of the 17 producing companies, 12 use marl and clay, four use limestone and clay, and one uses blast furnace slag. One other company, now in liquidation, but with completed plant, made cement from marl. Of the six plants being erected, four at least propose to use limestone."

JAPAN'S TRADE IN CEMENT.—According to an American Consular report, the total monthly output of cement in Japan, which was not more than 600,000 barrels two or three years ago, is believed to have been doubled. Now the import of cement is materially checked.

SCAFFOLDING FOR THE REPAIR OF BRICK BRIDGES.

By A. G. H. Thatcher.

Among the many difficulties with which the scaffolder is confronted, and upon which he has to exercise his ingenuity, is that of preparing the means by which the soffits of brick bridges can be reached when repairs are called for. Apart from the springing of the arch, which necessitates the erection of platforms of different levels, the difficulties are increased if an open way has to be kept beneath the arch for ordinary vehicular traffic, or if the bridge is carried over waterways, such as canals, streams, etc.

As bearing on this matter, the accompanying diagrams are given, showing a typical case and the best means by which the difficulties can be overcome. Fig. 1 represents a brick bridge used to carry railway traffic, and the work to be done is supposed to be the repair of the arch. The bridge is of 35ft. span, with a depth of 40ft. There is a footpath 7ft. 6ins. wide on each side of the road, and the road has to be kept open for a double line of traffic. Both the footpaths and the roadway have to be kept open for regular use. From the road centre to the crown of the arch the height is 22ft.

The scaffolder in this case has several matters to consider. First, no undue interference must occur to the traffic, either foot or vehicular. Secondly, the workmen carrying out the repairs must be within easy reach of their work, while, on the other hand, they must not be cramped for room more than necessity demands. The scaffold must be of sufficient strength and rigidity, and protected from accidental collision by passing carts, etc.

The diagrams, in their order, sufficiently explain how these points are dealt with. The standards have to be first arranged for, and when joined by the ledgers should be framed in two directions. The first standards should be fixed close to the pier wall from which the arch springs. Their distance apart, considering that no great weight is to be carried, may be anything up to 10ft. The standards which form the corners should be fixed outside the arch, but close up to the brickwork. In that position they tend to stiffen the framework of the scaffold, as (provided the connections are well made) no movement could take place in the direction through the arch. Second rows of standards are then fixed near the gutters, but not in them, and should correspond in position to those first erected.

Fig. 2 shows a plan of the standards, six in each row, and twenty-four in all. The first ledgers should connect the standards at a sufficient height over the footpath to clear pedestrian traffic, and where the vehicular traffic requires a greater height the utmost possible should be given— in this case about 17ft.

Fig. 3 is an elevation of the scaffolding as it crosses the roadway. It will be noticed that the central ledger has an extreme span between the standards AA. To give support to it, spikes can be driven into the brickwork, and a hempen or wire cord can be taken therefrom and carried round the ledger, as shown at B. This will take the place of a central standard, which, if fixed, would be in danger of displacement through collision with vehicles. Fenders should be fixed on the road-side of the standards near the gutter, as shown at C.

Braces to give rigidity are necessary, and should be fixed as shown in Fig. 4, which is an elevation of the standards, etc., standing near the gutter. Braces to prevent movement of the scaffold in a direction across the road (as shown in Fig. 3) are not so necessary as the standards upon the footpath, because, standing as they do close to the pier wall (as shown in Fig. 2), they can only move away from it, and the ledgers, if properly fixed, should effectually prevent this.

To draw the attention of those driving beneath the bridge that it is under repair, a bundle of straw hung downwards over the road is sufficient, and has the merit of not creating danger.

This method of scaffolding may cramp the workmen slightly in some positions, but on the whole may be taken as a satisfactory means of dealing with the difficulties.

The putlogs and boards have not been shown on the diagrams, but the putlogs should be fixed at right-angles to the road. The lowest platforms should be double laid and left so when the men are working higher. This will give protection to the traffic beneath. For the workmen's safety, guard rails and boards on edge should be put around the outside of the working platforms.

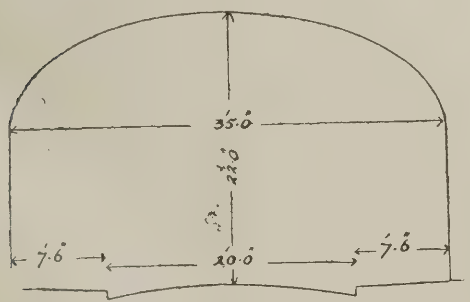


FIG. 1.

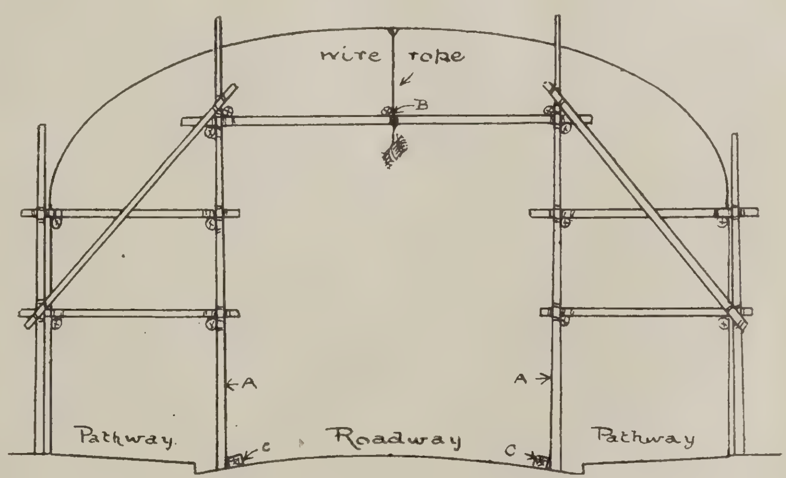


FIG. 3.

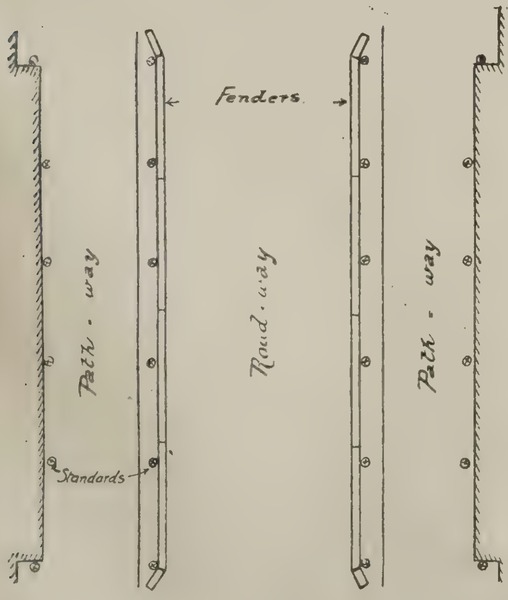


FIG. 2.

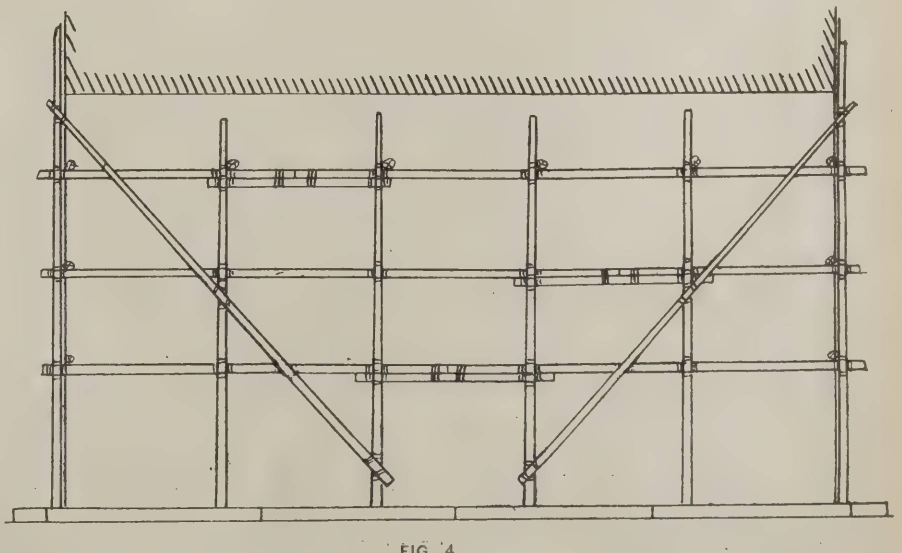


FIG. 4.

SCAFFOLDING FOR THE REPAIR OF BRICK BRIDGES.

INSTITUTE OF BUILDERS.

The 24th annual general meeting of the Institute of Builders was held at 31 and 32, Bedford Street, Strand, W.C., on Thursday last, when the minutes of the last annual general meeting were confirmed, and the audited accounts, balance sheets, and annual report of the Council were received and adopted.

The Annual Report.

stated that notwithstanding the reported flourishing condition of trade during the past year, the building trade had experienced a period of almost unprecedented stagnation, for which it was difficult to attribute a reasonable cause.

Effect of New Legislation.

Whilst the bulk of building operations had seriously diminished, the Legislature had been remarkably active in enacting laws (under the influence of organised labour) and the results were calculated to be of far-reaching importance to employers generally, adding materially to their responsibilities and to the expenses incidental to the carrying-on of their business.

Particular attention was drawn to the report of the Home Office Building Accidents Committee, which had issued, after a prolonged series of sittings, its recommendations in the form of a Blue Book (C. D. 3848). Mr. William Shepherd and Mr. G. Macfarlane—members of this Institute — served on the Committee with great assiduity and ability. Mr. H. H. Bartlett, Mr. Henry Holloway, and Mr. Nicholson were selected to serve on the Board of Trade Census of Production Committee, and rendered valuable help in the formulation of such questions as may be put to employers according to the Act of Parliament.

These and all other Bills affecting the building trade had been carefully followed, and action taken where there existed the probability of good resulting.

Water for Building Purposes.

A joint deputation from this Institute and the London Master-Builders' Association had waited on the Metropolitan Water Board in the hope of inducing that Board so to alter its Bill that builders and contractors should be supplied with water for building purposes by meter and be charged at the same rate as other tradesmen, but, unfortunately, with little effect. No alternative was left but to oppose the Bill before the Parliamentary Joint Committee. The opposition there succeeded in securing for builders the right, not previously enjoyed, to demand that a supply of water be granted for building purposes, without, however, being able to insist on a meter supply. This and local restrictions have had their share in limiting, to an appreciable degree, the legitimate expansion and development of building operations.

Form of Building Contract.

Many questions had been raised in connection with building contracts, and glaring instances had arisen where the agreed form had been ignored and others substituted and accepted by which builders had, not infrequently, placed themselves in a position of great difficulty. Such action was to be deplored, as it was bad for the trade as a whole and for the individual builder.

The Proposed Building Court for London.

Some steps had been taken to establish a Building Court for London. The question was now under consideration by the R.I.B.A., and the Institute of Builders had intimated its willingness to co-operate with that body.

Grants.

To carry out the object of the founders and to benefit those concerned, a committee had been appointed, and the following grants had been made from the Institute of Builders' Benevolent Fund during the past year:—

(1) Builders Benevolent Institution ... £50 0 0
(2) Provident Institution of Builders' Foremen and Clerks of Works ... 10 10 0
(3) Builders' Clerks' Benevolent Institution 10 10 0

Elections.

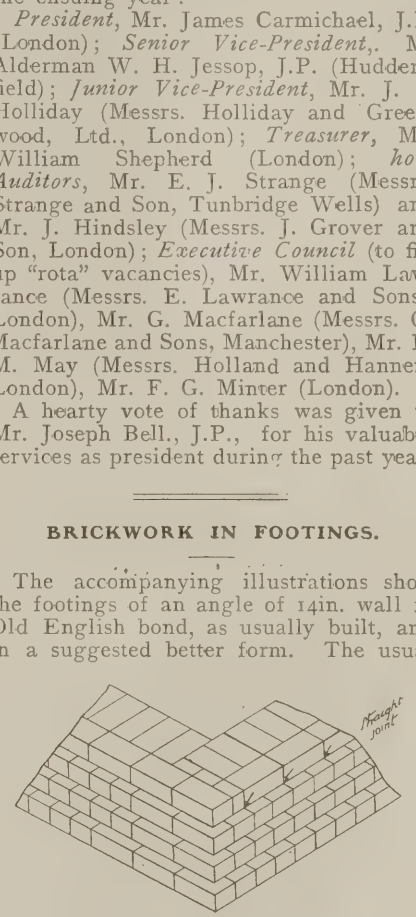
The following elections were made for the ensuing year:—

President, Mr. James Carmichael, J.P. (London); *Senior Vice-President*, Mr Alderman W. H. Jessop, J.P. (Huddersfield); *Junior Vice-President*, Mr. J. S. Holliday (Messrs. Holliday and Greenwood, Ltd., London); *Treasurer*, Mr. William Shepherd (London); *hon. Auditors*, Mr. E. J. Strange (Messrs. Strange and Son, Tunbridge Wells) and Mr. J. Hindsley (Messrs. J. Grover and Son, London); *Executive Council* (to fill up "rota" vacancies), Mr. William Lawrance (Messrs. E. Lawrance and Sons, London), Mr. G. Macfarlane (Messrs. G. Macfarlane and Sons, Manchester), Mr. F. M. May (Messrs. Holland and Hannen, London), Mr. F. G. Minter (London).

A hearty vote of thanks was given to Mr. Joseph Bell., J.P., for his valuable services as president during the past year.

BRICKWORK IN FOOTINGS.

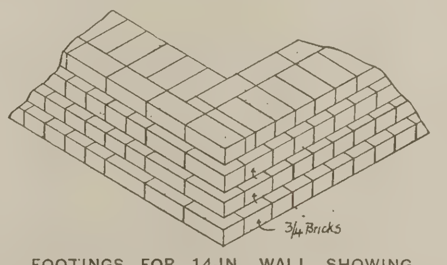
The accompanying illustrations show the footings of an angle of 14in. wall in Old English bond, as usually built, and in a suggested better form. The usual



FOOTINGS FOR 14-IN. WALL (ENGLISH BOND) AS USUALLY MADE.

method makes a straight joint between the top course of footings and the first course of neat work; the other method, with an arrangement of three-quarter bricks, does away with straight joints.

Although I have been a clerk of works



FOOTINGS FOR 14-IN. WALL SHOWING BETTER BOND.

ten years (and since 1905 under the Staffordshire Education Committee) I have not seen this done by any bricklayer without being shown, nor have I seen it in any text-book. Possibly, therefore, it will interest some readers.

J. CASWELL.

Builders' Notes.

A Refuse Destructor at Coventry is proposed to be erected at Bishopsgate Green, at a total estimated cost, including site, of £25,956.

* * *

Burlington Slates. — Mr. Frank Holme-Summer, of Dartmouth Hall, Queen Anne's Gate, Westminster, who represents the Burlington Slate Quarries in London and the southern counties, is arranging a practical exhibit of work carried out in the various qualities, sizes, and colours of Burlington slate, and hopes to have the same completed very shortly.

* * *

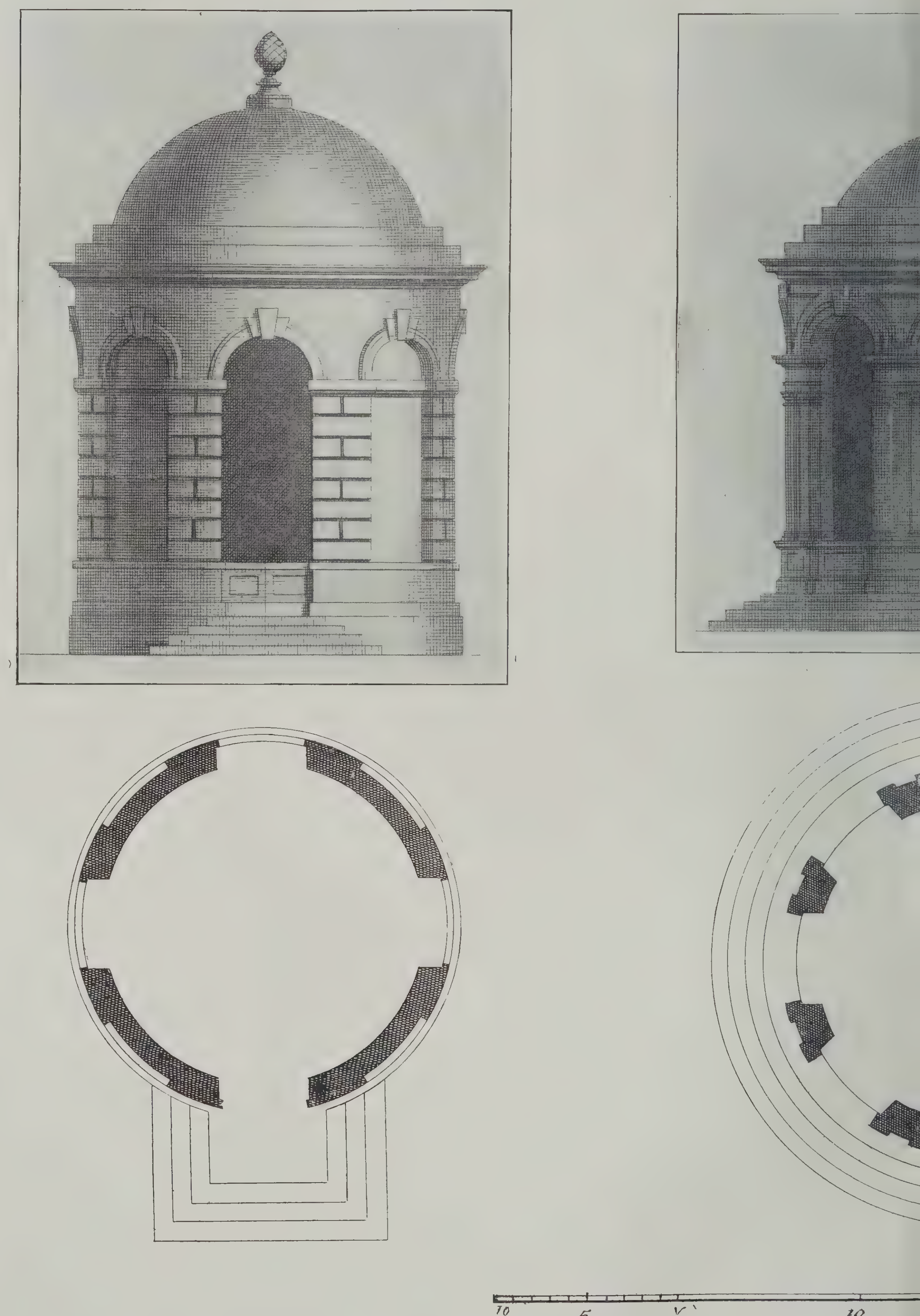
The Submission of Plans.—On March 20th, at the Huddersfield Police Court, Mr. B. Graham, builder and contractor, was ordered to pay fines and costs amounting to £3 1s. for having erected buildings in St. Thomas's Road without having given written notice to or deposited plans with the Corporation. His defence was that he simply pulled down some old stables and built others on the foundations. He communicated with the borough engineer, but did not accept his dictum that plans were necessary.

* * *

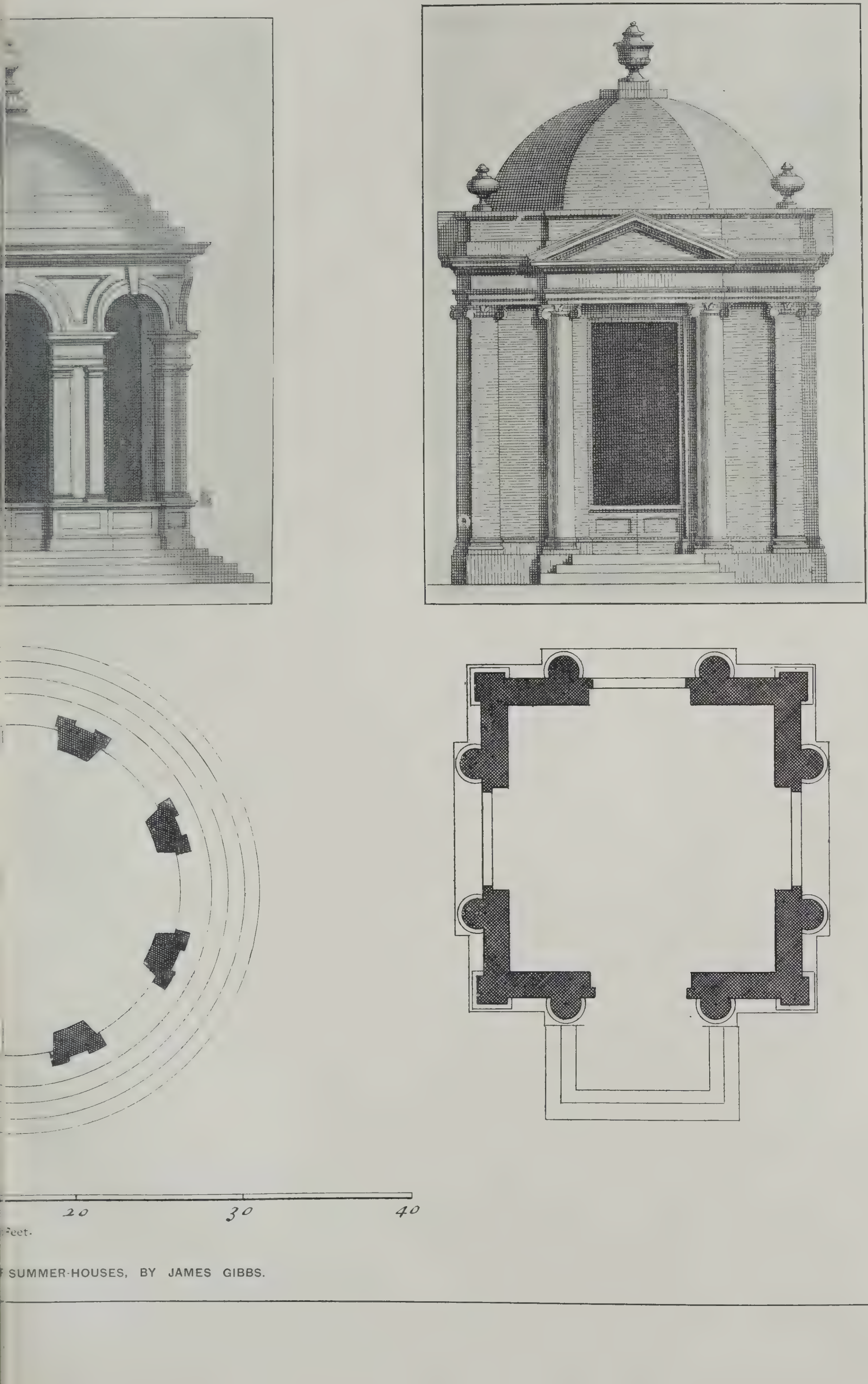
Manchester Joiners Demand an Increase.—The joiners have given notice to the Manchester, Salford, and District Building Trades' Federation to terminate the existing agreement on May 1st. They ask for a working system approximating to that of London, an increase from 9½d. to 10½d. per hour, and a re-arrangement of the working hours. On the other hand, the Employers' Federation propose a reduction in wages from 9½d. to 9d. per hour, with certain stipulations as to overtime. If the masters and men cannot come to a settlement by May 1st, the points in dispute will be submitted to a conciliation board.

* * *

Bath Stone Firms: an 8 Per Cent. Dividend.—The annual meeting of the shareholders of the Bath Stone Firms, Ltd., was held at the company's offices, Abbey Churchyard, on March 19th, Mr. Isaac Sumsion (chairman) presiding. The directors' report for 1907 was presented. This stated that the net profit for the year had been £15,399, added to which was the balance brought forward from 1906, £12,305, making a total of £27,704. From this had to be deducted the interim dividend paid in September last, £9,083, which left £18,621 available for distribution. The directors recommended that for the half-year ending December 31st, 1907, a dividend at the rate of 8 per cent. per annum should be declared, making, with the interim dividend paid in September, 8 per cent. for the year. This dividend would absorb £9,083, leaving a balance of £9,538, which balance the directors recommended should be carried forward. The long-expected improvement in the building trade was, unfortunately, still delayed, and the company's profits had consequently suffered from a lessened demand, and from an unusual number and amount of bad and doubtful debts; still, the directors felt justified in recommending an 8 per cent. per annum dividend, inasmuch as the large amount of undivided profits brought forward had been expressly reserved for the purpose of assisting dividends in times of temporary depression such as the present. The company was in an excellent position to avail itself to the full of better trade when it came.—The report was adopted.



SOME DESIGNS FOR PAVILIONS



SUMMER-HOUSES, BY JAMES GIBBS.

April 8, 1908. Volume 27 No. 687.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

The Architects' Technical Bureau. The circular letter recently issued by the Architects' Technical Bureau to a large number of manufacturers and specialists has come under our notice. Although the primary object of this Bureau (to which we have already drawn the attention of our readers) is the institution of an up-to-date organisation which will enable architects to obtain, from a central office, any requisite information and particulars relative to trade specialities, in addition, under the administrative arrangements proposed, manufacturers themselves may confidently expect to benefit by the time-saving methods which are to be employed. As was to be expected, this scheme to lighten the burden of a busy architect's practice by the establishment of a central Bureau has met with a large measure of approval and support, not only from leading architects, but from the profession in general. We have no doubt it will prove equally acceptable to the many manufacturers and specialists under whose notice it has now been brought. An organisation which will enable architects to be regularly informed of fluctuations in the price of, or any contemplated improvements in, the specialities they are accustomed to use should be supported by all manufacturers connected with the building trade.

The Re-erection of Famous Buildings. According to the "City Press" the sum of £10,000 which is the estimated cost of the re-erection of Crosby Hall in Chelsea has now been given by an anonymous supporter of the proposal. The success of this praiseworthy attempt to, so far, preserve an interesting example of Tudor architecture renews attention to the scheme, mooted by Mr. Rudolph Birnbaum, for the preservation of Old London buildings by re-erecting them "somewhere in the suburbs" as a miniature mediæval city. Although there is much to be said in favour of the general principle of the scheme, we fear that if an attempt were made to carry it into effect exactly on the lines suggested it would prove to be little short of impracticable. Mr. Leopold Wagner, who has written very sympathetically with regard to Mr. Birnbaum's proposal, reminds us that the work of the housebreaker often destroys that which is most valuable in the building we are anxious to re-erect; for instance, frescoes and painted ceilings cannot be removed *en bloc*, and, as a general rule, it is not possible to utilise in the re-erection of these structures anything more than the original main beams of a "half-timbered" dwelling; so that, speaking generally, the preservation of the ancient interiors of many old buildings is practically impossible. "Holywell Street transferred, say, to Shepherd's Bush would, at the best, have been an incongruous affair, partly ancient, partly modern. Recourse, therefore, might with all due advantage be had to accurate copies of the original structure built with enduring materials, so as to withstand the elements and the ravages of time." Mr. Wagner refers to the representation of an Old London street which was to be seen, a few years ago, at one of the exhibitions at South Kensington, and observes that exhibitions of that description have proved perennial attractions at Earl's Court. It would therefore be possible to reconstruct, at comparatively small cost, not only the demolished edifices of our own time, but many others which have figured prominently in London's history, as, for example, the Boar's Head Tavern (Eastcheap), the Tabard Inn (Southwark), the Eleanor Cross (Old Chepe), and Bridewell and the Fleet prisons. The leading architectural features of the above and other interesting buildings could be faithfully reproduced from contemporary prints and drawings. Mr. Wagner laments the loss of many relics of a vanished London which municipal apathy and municipal ignorance have allowed to pass into strange hands, such as the once famous City clock which, with its great striking figures, formerly adorned the front of St. Dunstan's Church in Fleet Street, the turret clock so long a familiar object on the recently-demolished church of St. Mary-le-Poer in Old Broad Street, and the original giants, Gog and Magog, of the Guildhall, which were purchased by a wealthy curio-hunter and eventually sold to a publican at Torquay. It may come as a surprise to many of our readers to learn that the small town of Swanage has acquired from time to time a considerable number of relics of Old London, amongst which are the Wellington clock-tower from the Surrey side of London Bridge, the ancient front of the Mercers' Hall in Cheapside, obelisks which formerly stood in Princes Street, Union Street, Borough, and King William Street, the stone archway from Constitution Hill, portions of the old Hungerford and Billingsgate markets, and carved oak and other ornaments from the ancient gates of Temple Bar. As a matter of fact, it appears to have been customary to allow the materials of demolished London buildings to be placed at the disposal of anyone who would undertake to bear the cost of their removal. Mr. Wagner also draws attention to the fact that many relics have vanished "no one can tell whither." What, he asks, has become of the original Seven Dials pillar, of the obelisk at St. George's Circus, or of the last of the "Old Charlies" boxes removed from the front of some banking premises in Fleet Street about a year ago? It is well known that the Guildhall Museum contains some very interesting and curious remains of Old London, and, if only for this reason, we share Mr. Wagner's surprise that a more suitable permanent home could not therefore have been found for the general relics obtained on the demolition of Newgate Gaol than the Chamber of Horrors at Madame Tussaud's. Undoubtedly all such remnants of a bygone age properly belong to a re-constructed Old London, which, "half sham and half real," would prove of the greatest interest to the citizen of the metropolis and offer a real and never-failing attraction to continental and trans-Atlantic visitors.

Foreign Slates sold as Welsh. Welsh slate dealers, like English Portland cement manufacturers, have suffered a good deal from the sale of an inferior foreign material under a fictitious name. An interesting statement on the matter is made in a letter from the Board of Trade, sent in answer to a correspondent who asked whether proceedings could not be taken against persons selling foreign slates as Welsh, as they were recently taken in a case in which English cloths had been sold as Scotch tweeds. Mr. Lloyd George, in reply, says: "*Prima facie*, any such sale would appear to be a contravention of the provisions of the Merchandise Marks Act, 1887, which forbids the application of a false trade description of goods. A false trade description as defined in that Act includes any description, statement, or other indication, direct or indirect, as to the place or country in which the goods were made or produced—that is, in a material respect. If, therefore, it can be proved that such a description is applied to the slates in question at the time of their sale in this country, an offence against the provisions of the Act would appear to have been committed, and in that case the Board would be prepared to

take proceedings under the Act. If you could therefore submit to us some specific instances of fraud we shall place the matter in the hands of the solicitor of the department with a view to action being taken."

Widening a Bridge.

Some interesting particulars of the widening of Union Bridge, Aberdeen, were given by Mr. N. Murray in a paper which he read last week before the Aberdeen Association of Civil Engineers. Four schemes were considered before deciding on the one which is now nearing completion. The first of these proposed a widened bridge entirely of granite masonry, but was abandoned on account of the cost. The second scheme was to carry the widened footpaths upon lattice girders borne on heavy corbels built into the existing abutments. The third proposal was to erect piers alongside the present arch, and to span the gaps between these with steel girders. The fourth—the one finally adopted—consists of widening the old masonry abutments and erecting two steel arches, one on each side, outside the old structure. These arches support vertical columns carrying horizontal girders and steel troughing. In forming the foundations good material was easily found at the west abutment, but at the east abutment soft ground was encountered, and the foundation had to be made with reinforced concrete. Above the foundations the abutments are constructed of granite masonry, and carry the skewbacks for the steel arch. The steel superstructure consists of two three-hinged steel arched ribs, one on each side of the old bridge. The design for the widening was prepared by Mr. G. R. Graham Conway, under the direction of Mr. W. Dyack, M.Inst.C.E., burgh surveyor.

American Practice in Bridge Work.

In a letter to the "Times," commenting on the Quebec Bridge disaster, Mr. William H. Booth, of Westminster, gives the following interesting particulars of bridge work in the United States:—"All American bridge work is, to begin with, closely designed, but progress has been slow, and while there may be considerable uncertainty as to the strength of steel columns, there have been in use in America huge testing machines capable of taking in full-sized bridge members. Speaking generally, bridge members are built up of what we in England term merchant sections—that is to say, they are built up of rolled bars of steel such as can be regularly supplied by the rolling mills. In the larger members, as was the case at Quebec, flat plates are employed with built-on flanges, and a very heavy column is really two, or three, or four columns combined and supposedly made to act as one rigid and uniform column by means of lattice bars. As bridges have increased in span, the rolling mills have added to their capacity to roll larger sections, and very much larger and deeper sections can be obtained in America than can be got in England. Now, in the Forth Bridge the compression members were heavy steel tubes, some of them as much as 12ft. in diameter. They were rolled up of thick steel plates and put together like the best boiler work with butt straps. Inside, heavy H longitudinal bars were riveted at frequent intervals round the circle, and in this way the whole of the material of the tubes was placed far from the neutral axis, the resistance of the tube was a maximum for its diameter, and the full strength of the material was developed. Ideally it ought to be possible to take three I beams and add others to their ends and lattice them together so that this compound strut shall take the stress that it is calculated to take. But in shopwork these conditions cannot be secured, and the failure at Quebec is almost certainly an example of the undesirableness of trusting to merchant sizes of bars and commercial systems of construction in abnormal structures, for, with the American system of bridge construction, the Quebec Bridge was abnormal. Merchant sizes can only be used for what may be called merchant bridges—bridges that have grown up under a system of trial and error by little steps at a time."

The Attempt to Popularise the Casino.

It would appear that the time-honoured attractions of English seaside resorts are at length beginning to pall upon the community. The Corporation of Bournemouth has for a long time past had under consideration the question of providing the town with a sea-front pavilion. The minds of the good people of Brighton have recently been considerably exercised over the proposal to establish a new place of amusement in their town, to be known as a winter resort and summer palace: and now Hastings, doubtless urged to take action through dread of being eclipsed by the superior attractions of rivals, has brought forward a scheme for a casino estimated to cost more than £100,000. We must frankly confess our inability to precisely designate the component essentials which alone would enable us to discriminate between the counter-attractions of a "sea-front pavilion," a "winter and summer palace," and a "casino." But, assuming that the real difference between these, apparently, varied proposals is merely one of nomenclature, we are not at all certain that the costly buildings which appear likely to be erected in the near future in these, and other, English seaside health resorts will prove permanently attractive to visitors of the class whose patronage it is desirable to obtain. It is true that the average Englishman thoroughly enjoys the varied attractions, the brightness and freedom from restraint of the Continental casinos, which usually serve as centres for the amusements of the town in which they are placed. But is not our fellow-countryman's appreciation of these palaces of amusement due to the novelty of his environment, the brightness of the climate, and the gaiety of the people, rather than to any inherent attractions possessed by the casinos themselves?

The Mile End Scandal.

Last week the report of the Local Government Board inspector, Mr. F. J. Willis, who held an enquiry into what had been done in connection with the guardians' scattered homes at Mile End, was issued as a Parliamentary paper (Cd. 4011). The guardians concerned in these transactions, as well as the builder (Mr. Calcutt) and the coal contractor (Mr. Cade), come in for censure—it having been proved that the builder's work was grossly extravagant in cost, that work amounting in value to more than £20,000 had been executed without a specification and contract, that false bills had been made out, and that the average yearly expenditure for repairs was about equal to the rack-rent of the houses. The inspector also found that a group of guardians had put improper pressure on Mr. Knight, the architect, and that Mr. Knight had failed to exercise a proper supervision over building works, and had given certificates for larger amounts than were really due.

Official Architects: a Protest.

In the report of the council presented to the recent annual general meeting of the Northern Architectural Association a protest is made against the "official" architect in the following terms:—"The council feel it a duty to the ratepayers, broadly, and to the profession, personally, to protest most earnestly against the institution of a large, costly, and permanent architectural staff, set up by the Newcastle Corporation, knowing that if public work were placed in ordinary competition, the ratepayers and the art of architecture would be benefited. With the employment of private firms the costs would cease on the completion of the work, whereas the cost of the permanent staff never ceases, and architects who are all ratepayers are contributing to funds the effect of which is causing their unemployment."

The Granite Controversy at Birmingham.

We have no intention of entering into the controversy that has been going on at Birmingham in regard to the proposal to use Norwegian granite for the base of the Council House extension, nor of opening our columns to the discussion of the points raised on both sides, but we think it only proper to put on record the report which the General Purposes Committee will present to the next meeting of the Birmingham City Council, after having had the matter referred back to them for detailed information. In pursuance of instructions, the Committee made enquiries as to the various British granites which are possible alternatives to the Norwegian "Grey Royal" granite, as specified by the architects (Messrs. H. V. Ashley and F. Winton Newman) and included in Mr. Rowbotham's tender. The following particulars have been obtained through the architects:—

Norwegian—"Grey Royal"	Cooper, Wetton & Co.	£7,137
Cornish—Penryn	John Freeman	6,452
Cornish—Carnsew	John Freeman	6,795
Cornish—Colcerrow	John Freeman	6,795
Scotch—Aberdeen	John Fyfe, Limited	7,774
Scotch—Dalbeattie	D. R. and J. Newall	9,088
Price of *Norwegian* "Grey Royal" worked in Great Britain		8,560

The architects' report, dated February 22nd, which was read to the Council at the March meeting, states:—"It is our opinion that the Norwegian stone best answers the purpose, and chiefly for the following reasons:—Firstly: It is a more durable stone—for example, in scientific tests for abrasion, for volume of voids, for absorption of water, for resistance to weathering, and for crushing strength, this granite is shown to be better than the Cornish or even Scotch variety; in chemical and physical composition it is also superior, being a closer-grained stone, with the quartz, felspars, and black mica more evenly distributed. Secondly, it has a better appearance and colour than Cornish, and, owing to its hardness and close grain, it can be more easily kept clean in a town atmosphere, and is less liable to be attacked by the acids in the air, and we feel sure it will harmonise better with the Darley Dale stone of the super-

structure and with the adjoining building." In their report of March 23rd, enclosing the prices set forth above, the architects state that, next to the Norwegian granite, they "are of opinion that the one submitted by John Fyfe, Limited, of Aberdeen, should have the chief consideration of the Committee. We consider that this Scotch granite is much to be preferred to Cornish for the reasons stated in our report to you on this subject dated February 22nd last. The stone is closer grained, more even, and darker in colour than the Cornish variety, and, further, it has not the large black and white crystals so common in the West Country stone, and which mar its appearance and cause irregularities in the finished surface. The new London premises of the Northern Assurance Co. have been entirely faced with stone from John Fyfe's quarries, and, after a most careful comparison of this with buildings faced with Cornish, we are confident in advising you as to the superior quality of Aberdeen stone. We have always regarded the North Country granite as very nearly equal to the Norwegian, but the element of cost has always favoured the latter. The present quotation, however, is only 8 per cent. in excess." The effect of the architects' reports is that, apart from the question of price, and considering only the suitability of the granite for the purpose intended, they place Norwegian first, Aberdeen second, and Mr. John Freeman's Cornish third—all of these being preferable to Darley Dale stone. The Committee would unhesitatingly give the preference to British-worked stone were all other considerations equal, but this cannot be said to be so in this case, and they are of opinion that it is their duty to recommend the granite most suitable for the particular building in which it is to be used. They are therefore unable to depart from the advice originally given to the Council, namely, to use Norwegian granite.

The Lady Architect. At a conference held last week at Caxton Hall, Westminster, under the auspices of the Central Bureau for the Employment of Women, Mr. R. Weir Schultz gave an interesting address relative to the question whether architecture is a suitable profession for women to follow. During the course of a very able dissertation on the possibilities of the profession, Mr. Schultz remarked with regard to an obvious objection that might be raised against the professional employment of women, that he knew many eminent architects who disliked going up ladders, and after reverting to the various methods of training best adapted to meet the requirements of the embryonic lady architect, he expressed the opinion that women would have to combat much prejudice before they attained their object. He thought that opposition would arise both from architects and their assistants, of whom the latter might well bear the competition of cheaper labour in the general routine duties of an architect's office.

BALCONY CORBEL IN STONE (ITALIAN, 15TH CENTURY) FROM THE MARCOTO COLLECTION.

A County Architect for Cumberland. The Cumberland County Council held a special meeting recently to discuss the question of the duties and salary of the county architect. So far as Mr. Dale Oliver, the present county architect, is concerned there was a consensus of opinion that he had performed his duties in a thoroughly efficient and satisfactory manner. The trouble turned on the question of commission on large schemes. One section of members favoured the appointment of an architect for the purpose of doing designing and special work, with a building surveyor to look after the numerous minor matters connected with county buildings, schools, etc. They proposed to pay the architect £500 a year and a commission of 2½ per cent. on above £5,000 of the cost of new buildings, and to pay the surveyor of buildings £300 a year, including the cost of a clerk. Another section was in favour of appointing one man to do all the architectural work of the Council and the Education Committee, to devote the whole of his time to the work, and to be paid by salary only. After several hours' discussion, this latter proposal was carried, and a committee was appointed to report upon the duties, etc., of the new official.

Girders at Winchester. In "Country Life" a correspondent makes a protest against what has been done at Winchester College Chapel. After referring to Butterfield's removal of the Grinling Gibbons screen (illustrated in our issue for February 19th last) he says:—"At that time this immense sacrifice was considered necessary on the score of architectural purity. Now an attempt is being made to alter this late Gothic gem into the semblance of the most business-like modern railway station. To gain a few feet of floor room, iron girders have been thrust across the chapel, breaking every original line and curve, bisecting one of the north windows and one of the south arches, and throwing the fan vaulting wholly out of proportion and harmony. And between the iron girders some very scientific preparation forms a substantial floor, of which the City Council's surveyor will, I am sure, approve. . . . We have lived through an age of 'restoration' that has needlessly cast out a considerable number of galleries that were quite of harmonious composition and of architectural merit, and has rightly removed a much larger number that were very nearly as offensive and out-of-place as that which is in process of erection at William of Wykeham's foundation. We had been beginning to flatter ourselves that we were entering upon a more intelligent and discriminating era. How disappointing, therefore, it is to find a corporation that is entrusted

not only with the care of one of our most valued groups of historical buildings, but also with the education of a considerable section of the picked youth of the day, guilty of the Philistinism for which our grandfathers have been so severely blamed."

THE ARCHITECTURAL ASSOCIATION.

Mr. Lewis F. Day on "Originality and Tradition in Design."

A meeting of the Architectural Association was held on Friday evening last at 18, Tufton Street, Westminster, the chair being occupied by the president, Mr. Walter Cave, F.R.I.B.A.

Mr. H. T. Harvey and Mr. C. W. Rogers were elected members of the Association.

The president proposed a vote of thanks to the Royal Institute of British Architects for its seventeenth annual grant of £100 towards the Association's educational scheme.

A paper on "Originality and Tradition in Design" was then read by Mr. Lewis F. Day.

"For every age its own art!" That was a good motto, said Mr. Day. But what did it mean? "Are we to understand by it that our art is, or ought to be, or can be, independent of the art before our time? I think not. On the contrary, it seems to me it is, and must be, the natural outcome of it. . . . We are modern, it is argued; our art, therefore, should be modern; we should endeavour to make it as modern as can be. Well, it is, and can't help being, modern. The question is whether we are, therefore, to force the 'new' note, and make it always dominant? I think not. Sufficient for the day is the modernity thereof."

The Price of Independence.

Perhaps the most momentous danger ahead of modern art was that we seemed to be losing hold of tradition. There was a strong movement in the direction of independent design. Mr. Day entirely sympathised with that. But we had to buy our right to independence—and the price of it was knowledge. One thing was very clear, that those who forswore all beaten tracks had not so far succeeded in justifying their departure from them. Rather, they made us think, when they went near to success, what might not such men have done if they had only been big enough to learn from their forerunners?

The first step towards good work was to know, to appreciate, and to sympathise with what was good. In that category traditional work bulked large. "You have there the sum of all experience up-to-date, preserved and sifted for you. Is it to count for nothing with you? Say you don't mean to follow precedent! No one wants you to. But you can depart from it more surely when you know what it is. And even if your idea is to turn tradition upside down, you may as well begin by knowing which is the right way about."

None of us could afford to dismiss whatever had been done as so much "ancient history" with which a modern had no concern. Truly the way to make ready for new design was to study the old—to compare one past style with another, and all of them with that which was current today. "A man can't do that without coming to know what is best, and especially what is best for him. He is not called upon to copy what has been done—except by way of exercise. Let him go to it for what it teaches him: the last thing he will learn from it is to imitate it. He may embody in his own work all it has to tell him, and it may yet be design, and original design."

It was at once characteristic of the modern artist, and a sign of weakness in him, that, for all his reckless daring, he was so terribly afraid someone should say his work was not original; yet there was probably no really fine work of any period without some reflection in it of a period before; and so far as the "moderns" went, it was really surprising to note what a sameness there was about their work.

Men of the Nineteenth Century.

Continuing, Mr. Day said that nobody who knew anything of the Renaissance, or of later Victorian movements in this country would deny that artists had done good work more in the manner of the past than of their own time. Some of the best men of the nineteenth century were, so to speak, out of step with their time. "You may call Alfred Stevens a disciple of Michelangelo, Burne-Jones a reflection of Botticelli, William Morris a latter-day Goth; but when you have done that you have not explained away those masters. Say what you like, their work is theirs—as strongly individual as the performance of men more representative of their day."

FOUNTAIN IN COUR D'HONNEUR, VERSAILLES.

It was a vanity of the moment to be determined to owe nothing to anybody. As if we could help being influenced! But it was neither vanity nor affectation which made a man think there was more to be learnt at the British Museum or the National Gallery than at the International and the New English Art Club, more to be learnt at the Trocadero or at the Architectural Museum than at the Arts and Crafts Exhibition.

The Artist's Right.

An artist (not being an antiquary) reserved, of course, the right to depart at any moment from the traditional style from which he may have set out. Did not the Italians of the Renaissance work Arab detail into their scheme of ornament? Did not Morris work Persian as well as Gothic into his? "If something from Japan or Timbuctoo comes appropriate to my design, what is to hinder me from adopting it? The difficulty of it? That is my affair. If I make a mess of it, of course, my art is to blame. To fail is always to be in the wrong. For that reason I do not advise the inexperienced to depart too rashly from the ways of tradition. In the end an artist builds up his own traditions—more or less out of what he has gathered from sources outside himself. And in his choice he shows himself original—or not."

On Harking Back.

"It is matter of history what Roman owed to Greek and Greek to earlier art, how the Renaissance harked back to classic precedent, how art has always, from the first, been influenced by what went before it; how one phase of art has grown out of another, as it were in the course of nature; how all design is a matter of evolution.

"Our originality is not a spontaneous generation of our own. There go to it, in addition to our personality, the influences of tradition and of the times (which work, of course, through us). Throw tradition to the winds, and they will blow it back in your face.

"The malady of Victorian design was that it was so little of its period. It pretended to be in turn Gothic, Queen Anne, Jacobean, and I know not what. Edwardian cleverness has cured all that, and given us something that claims to be at once original and up-to-date. Well, the remedy is rather worse than the disease. I will not say that the latest aberrations in design are the result of paying no heed to tradition—original sin in the artist may count for something of it—but I am sure of this—that no one quite appreciative of traditional styles of design could ever have indulged in the extravagances which everywhere confront us in design priding itself on its entire originality. Yet I should be sorry for the age we live in if I thought the latest forms of would-be originality expressed it. They tell only of a group of agitators seemingly so innocent of artistic appreciation as not to see how remote this restless doing is from all that makes art worthy of respect."

The Middle Path.

In conclusion, Mr. Day said that the claims of tradition on the one hand, and of originality on the other, might not be easy to adjust. But the adjustment had to be made. Everyone with a spark of originality in him would want to express himself. Everyone who did not see his originality out of focus would feel that tradition had some claim upon his respectful consideration. The question was always how much of original invention was compatible with the purpose in hand, how much of traditional treatment with perfect freedom of design?

No one could settle that for another. A man must act for himself. It was perhaps very much a matter of temperament whether he were inclined to keep to the old road (the easy way) or to find always a new path of his own (the pleasant way). The way to success lay somewhere between the two.

A discussion followed, in which Messrs. Louis Ambler, Theodore Fife, F. Dare Clapham, J. B. Scott, C. H. Strange, D. A. Forster, Percy May, G. R. Ward, A. H. Belcher, T. C. Yates, H. W. Brittan, A. Whitelaw, T. L. Dale and V. Reinaecker took part.

Law Cases.

Contractors' Liability in Regard to Repairs.—A case of interest to contractors came before Judge Parry in the Manchester County Court on April 1st. In December last Messrs. Robert Neill and Sons, contractors, were engaged to make some alterations to a building in Piccadilly, Manchester. It became necessary to raise a chimney stack, and this was agreed to by the owner of the property and the owner of an adjoining block. The carrying-out of this work resulted in a heavy fall of soot and debris down the chimney and into the room of a tailor's shop, with the result that the walls required redecorating and the clothing in the shop was seriously injured. For this the tailor, named William Tilsley, claimed damages. It was contended on his behalf that the alterations should have been carried out without injury to the property of a tenant. The contractors ought either to have blocked the fireplace themselves when the work began, or have asked the plaintiff to do it. For the defence it was contended that Messrs. Neill were doing the work for the landlord, and were not liable for the damage, inasmuch at it happened after the day's work was over, and was due to a heavy fall of rain. —His Honour said that a temporary chimney might have been "rigged up," or the defendants should have warned the plaintiff when the work began. The former was the proper course, because there was no reason why a tenant should go without fire for the convenience of somebody else's contractor. The defendants had acted without reasonable skill and care, and there would, therefore, be judgment for the plaintiff for £27 12s., with costs.

Copyright Designs in Catalogues: Claim for Infringement. — An action for infringement of copyright in a catalogue was heard recently in the Nisi Prius Court, before Mr. Justice Jelf. This action was brought by Messrs. Smith, Sons, and Co., of Birmingham, against Messrs. Marley Brothers, of Aston, to restrain the latter from infringing the copyright of the former's catalogue of metalwork, and claiming the return of certain drawings and designs. The plaintiffs brought evidence to show that mistakes in their catalogue had been copied into the defendants' catalogue, the inference being that particular illustrations were traced reproductions. Illustrations of a cell door and of a ball-bearing pulley were especially mentioned as showing how mistakes had been repeated. The evidence of Mr. E. P. Marley, however, was to the effect that the illustrations of the ball-bearing pulley and of the cell-door were made legitimately, and were in no sense copies. The latter was represented as being the design of Mr. Buckingham, when the firm in which Mr. E. P. Marley was interested was known as Marley and Buckingham. (In 1894 the business of Messrs. Marley and Buckingham was amalgamated with that of Messrs. Charles Smith and Co.) Counsel for the defendants dwelt upon the futility of copying the cell-door design, supposing this to have been done, in view of the fact that such doors were in use in prisons all over the country, and were supplied by the defendants amongst other firms; they could easily have made a drawing from one of their own doors; while, as to the pulley, Mr. Marley was the inventor of it, and could have drawn it blindfold. Designs of window casements, which were further questioned, were also their own.—In giving judgment his Lordship said that where there was a conflict of evidence between the parties he had come to the conclusion that the evidence for the plaintiffs was more credible than that for the defendants. He gave judgment for the plaintiffs, observing that he was satisfied beyond doubt that defendants had infringed the copyright in respect to the cell-door, the pulley and the window casements. He granted a perpetual injunction against the defendants restraining them from further infringements of these or similar copyrights. The injunction would carry costs, except in so far as the issue for detinue, as to which the plaintiffs would pay the costs to the defendants, to be set off against the general costs paid by the defendants to the plaintiffs.

An Ancient Lights Case.—The case of *Richard Clarke and Co., Ltd.*, and *Charles Gorst v. Ellis Horrocks* was heard recently in the Chancery of the County Palatine of Lancaster, before Vice-Chancellor O. Leigh Clare. We give the following summary of the "Times" report: — The plaintiffs were the owners and occupiers respectively of a public-house in Tiviot Dale, Stockport, and the defendant was both owner and occupier of premises adjoining the plaintiffs' public-house. The yards at the back of the two properties were divided by a wall, upon which the defendant had recently erected a hoarding, which constituted the alleged obstruction of light to the smoking-room window (facing west) and other windows. The windows themselves were not old, the plaintiffs' premises having been rebuilt in 1896. Before the rebuilding the smoking-room had been a kitchen. It was admitted that each of the windows in question incorporated part only of an ancient window, and also that the greater part of each window was new and entitled to no protection.—The Vice-Chancellor, in giving judgment last week, came to the following conclusions of fact:—(1) That the hoarding would have caused a nuisance within the meaning of *Colls v. Home and Colonial Stores* to the old kitchen as lighted by the old window; (2) that if the smoking-room had been in existence to-day, lighted by only the old window, there would have been no answer to an action based on the hoarding; (3) that the hoarding has very largely diminished the amount of light coming into the new window generally, and that such diminution was principally caused by the obstruction of that portion of the new window coincident with the portion of the old window; (4) that if the hoarding were taken down the smoking-room would not have more light than would be reasonably required for such a room, whether used—as at the present time—as a smoking-room or as a kitchen; and (5) that the plaintiffs by the alteration and enlargement of the window had not thrown upon the defendant any greater burden than was upon him before the old house was pulled down. Continuing, the Vice-Chancellor said: "(1) A man cannot, by reducing his ancient light, thrown a new burden, or increase an existing burden upon his neighbour; (2) a man by reducing his ancient light does not (unless it becomes a case of *de minimus*) lose his right to object to a building on his neighbour's land, which he might have objected to before such reduction, unless the building does not seriously affect the reduced window; (3) the mere closing-up of a part of an ancient window does not confer upon the owner of the servient tenement any right to erect a building which he could not lawfully have erected before such reduction, unless he can show that the reduced window will not be affected by such building. Under the circumstance I give judgment for the plaintiffs with costs."

A Claim for Chipped Glazed Bricks. —At the Sheffield County Court on April 1st his Honour Judge Benson gave judgment in a case in which Messrs. C. T. Faulkner and Co., carting contractors, of Sheffield, sued Messrs. James Fidler, Ltd., builders and contractors, of Sheffield, for £16 2s. 11d. for carting. This claim was admitted, but there was a counter-claim against the plaintiffs for £21 12s. 3d. for damage done to a number of glazed bricks while in transit from Bridgehouses Station, Sheffield, to the new Metropole Hotel in Leopold Street. About 70,000 of these bricks were delivered, and it was alleged that 1,935 of them were found to be chipped on delivery. On behalf of the plaintiffs it was submitted that the bricks were delivered as they were received from the railway company at Bridgehouses, and that proper care was exercised in the carting of them from the station to the hotel.—His Honour gave judgment for the defendants on the counter-claim for the amount claimed.

Value of Limestone Working: An Appeal Case.—An important case came before the Court of Appeal last week from a decision of Mr. Justice Bray in the matter of an arbitration between the Rugby Portland Cement Co. and the London and North Western Railway Co. In this case the cement company claimed a large sum from the railway company for the purchase by the latter of certain limestone and minerals. The claimants were the owners of land in a limestone district near Rugby, and they sold part of it to the railway company under the latter's special Act of 1883, which authorised the making of the line from Birmingham to London. Under the Act all limestone and minerals were excepted from the purchase. The claimants erected a factory on their land adjoining the land so acquired by the railway company, and gave notice to the company that they intended to work certain limestone near to and under the railway. The company gave two notices to treat, one for the purchase of the limestone near the railway and the other for the purchase of the limestone under the railway. With regard to both sets of stone the claimants contended before the arbitrator that the value of the stone to them as the owners was to be assessed on the basis of what they might fairly be expected to have made out of it by working it in the ordinary and reasonable manner in which it would have been worked but for the notices to treat. On the other hand, the railway company said the claimants were entitled to only the market value of the stone. The arbitrator, who made his award in the form of a special case, fixed the purchase money for the two sets of stone at £523 and £896 respectively if the railway company's contention were right, and at £6,074 and £9,180 respectively if the claimants' contention were right. The special case was argued before Mr. Justice Bray, who held that the claimants were entitled to the two smaller sums only, having regard to the fact that they had large quantities of stone equally convenient and accessible, and also having regard to the fact that in the ordinary course of working they would have sufficient stone for many years, and that the loss of the stone could only affect them after a long period of years. The

claimants appealed, contending that they should have been awarded the two larger sums. There was a cross appeal by the railway company, who submitted in regard to the stone under the railway that the claimants were entitled to nothing, because the getting and working of this stone, as the company contended, would be in contravention of their special Act.

Notes on Competitions.

Warrington Garden Suburbs.

Competitive plans for the development of two estates belonging to the Warrington Garden Suburbs, Ltd., were invited recently. Both premiums were awarded by the assessor (Mr. Segar Owen, of Warrington) to the designs of Messrs. A. and J. Soutar, of 59, Westover Road, Wandsworth, which we illustrate on this page. Twenty-one schemes were submitted. The promoters asked for a recreation ground of three acres on each estate, and provision for twelve houses to the acre over the remainder of the sites. It was desirable to provide, as far as possible, a lay-out which would prove attractive alike to intending builders and tenants, it being at present the intention of the company to lease the plots, while retaining to themselves the right to reject designs which do not appear to them to be suitable.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
May 1	ENLARGEMENT OF PRINCESS ALICE HOSPITAL, EASTBOURNE. —Limited to local architects. Premium £25. Particulars from J. H. Silkstone, 6, Bedfordwell Road, Eastbourne.
May 1	FARM BUILDINGS.—Premiums £50, £25, £15 and £10. Particulars from Thomas McRow, Secretary, R.A.S.E., 16, Bedford Square, W.C. Summary in BUILDERS' JOURNAL, March 25th.
May 8	DOOR AND WINDOW FITTINGS.—(Assessors, Mr. Henry T. Hare, F.R.I.B.A., and Mr. Leonard Stokes, F.R.I.B.A.). Premiums of 15, 5 and 3 guineas. Particulars from N. F. Ramsay & Co., 1, Victoria Street, Westminster.
May 14	SCHOOL AT KINGSDOWN, BRISTOL (to accommodate 500 children).—Limited to local architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May 15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May 31	EMERGENCY HOSPITAL AT ILFORD. —Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
1909. Jan. 1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date; final competition to be limited to six competitors. Particulars will be issued shortly.
Date not yet fixed.	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall Eccles, Lancs.

Correspondence.

The weather-resisting Quality of English Tilework.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—In his paper on "The Decoration of Steel and Reinforced Concrete Structures," published in your issue for March 25th, Mr. James Salmon, F.R.I.B.A., makes some remarks about English tile work which, I think, call for some reply.

Mr. Salmon says that "ordinary tiles" will not stand outside in our country. As a matter of fact, however, "ordinary tiles" do stand perfectly well when the "ordinary tiles" are thoroughly well made, properly fired, and properly fixed. Several lots of these tiles have been fixed outside buildings in Shropshire, Birmingham, London, and Brighton — to cite a few instances. In each of the cases fairly large areas have been laid, both on the surfaces of the outside walls of houses and on the ground outside, and in every case not a tile has perished, so far as we are able to tell. The examples with regard to public-houses in many towns—for instance, in Liverpool, which is a North Country town subject to many vicissitudes of temperature in the winter—where large quantities of our outside plain ordinary tiling have been used, also prove the weather-standing qualities of good English tiles.

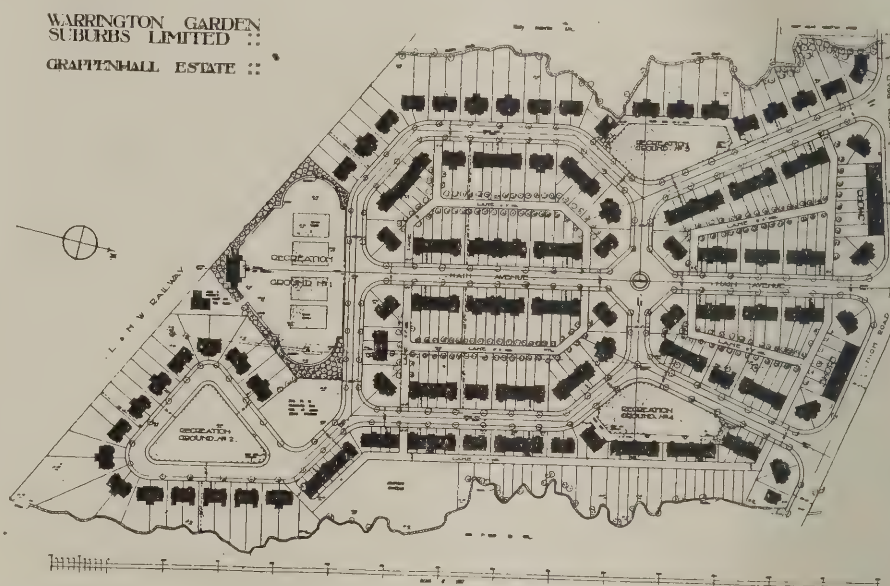
Yours truly,
For Craven, Dunnill and Co., Ltd.,
F. RAWDON SMITH.

Jackfield, Shropshire.

"A Garage Roof."

To the Editor of THE BUILDERS' JOURNAL.

SIR,—I should like to supplement the letter from Mr. A. G. Harrison regarding the garage roof illustrated in your issue of March 18th, in which the roof is described as a "new departure in roof construction" and as a "patent self-supporting system." There can be no patent or novelty in a system which has been in use for nearly a generation. The earliest example of which I am aware of this type of roof is that over Carlisle Station,



SELECTED PLANS. A. AND J. SOUTAR, ARCHITECTS.

which was completed about thirty years ago. About the same time the boiler shops for Messrs. Scott and Co. at Greenock were erected with cantilever trusses supported on cross girders, as described in the article. The railway station at Newcastle-on-Tyne is also of this construction. About forty engineering buildings have been constructed in Scotland and the North of England during the last fifteen years on the cantilever system, the latest examples being those for Messrs. Yarrow and Co. at their new works at Scotstoun, near Glasgow. The whole of these roofs were designed and manufactured in the United Kingdom, and show that we do not lag behind Continental firms in constructional designs.

Yours truly,
ADAM HUNTER.

Rutherglen.

IN PARLIAMENT.

(By our Press Gallery Representative).

Public Works and Monuments.

The annual discussion on public buildings took place last Thursday on various votes in charge of the First Commissioner of Works. It was characterised by a vigorous protest from the Scottish representatives against the meagre recognition of Scotland's needs in the respect to public buildings.

Mr. Harcourt remarked that Scotsmen had been so insistent and successful in their demands that they had already obtained almost everything they wanted, and that was the reason why so small an amount appeared on this year's estimates. It was poor England that was trying to make up some of the leeway.

The Mall.

In reply to the various questions raised Mr. Harcourt said he could not fix the exact date when the roadway of the Mall would be opened, but he thought it would be within two years. The superstructure of the Admiralty building at the end of the Mall was going on fairly rapidly. Only one half of the building would be devoted to the First Lord of the Admiralty and the First Sea Lord. The other part was an additional block of the Admiralty building. When the present residence at the Admiralty of the First Lord was vacated he would gladly consider the suggestion that had been made as to making a decent step between the beautiful Horse Guards and the other block. If he were to do this it would be necessary to re-face the Paymaster-General's Office. He did not know that much artistic value was placed upon the brick elevation of the curious building on the Park side. As to the opening of the Mall, the last Government provided for the pulling down of three houses to make a way through to Trafalgar Square. It was decided by the late Government that that was as much as they ought to be called upon to do, and he had not attempted to upset that decision, further development on the Square side being more in the nature of a Metropolitan improvement. In that position the matter was still resting.

National Gallery Extension.

As to the extension of the National Gallery, he was just making arrangements whereby the ground would be cleared altogether of military buildings. The recruiting station was now going to Scotland Yard, and he was taking powers in a Bill which he hoped the House would shortly pass for the closing of part of the roadway in Scotland Yard with a view to the improvement of the thoroughfare through to the Embankment.

The scheme for the erection of four new law courts on the west side of the existing block in the Strand was exactly the same as that which had been approved by by Mr. Akers-Douglas.

Foreign Granite in Government Dockyards.

Numerous questions have recently been addressed to the Secretary to the Admiralty by both Scottish and Irish members as to the desirability of asking contractors in connection with tenders for Admiralty works to state whether they propose to employ British or foreign granite or cement.

Mr. E. Robertson, the Secretary to the Admiralty, has undertaken to consider the matter in connection with the Rosyth contract.

Mr. Lloyd-George has informed Mr. Fell, who wished to know the hours and wages of the men employed in Cornish and Aberdeen granite quarries, which had failed to compete with the Norwegian quarries in Government dockyard contracts, that the summer hours of labour at Aberdeen quarries were 56 and 57 per week, the average weekly earnings of quarries for the full week being about 25s. 6d. The information with regard to Cornwall was not available.

Notes and News.

NORTHERN ARCHITECTURAL ASSOCIATION.—The new president of this Association is Mr. G. T. Brown, in succession to Mr. A. B. Plummer.

* * *

MR. C. L. MORGAN, A.R.I.B.A., architect and surveyor, has taken new offices at Cloak Chambers, 6 and 7, Cloak Lane, Cannon Street, E.C. (adjoining railway stations). The telephone number (7,825 London Wall) remains the same.

* * *

MESSRS. PATMAN AND FOTHERINGHAM, LTD., have been selected to erect two ornamental pavilions for the Ardath Tobacco Co. at the Franco-British Exhibition, and also for Messrs. Schwepps's, mineral water manufacturers, under Mr. H. W. Burton, architect.

* * *

PAINTERS' STRIKE AT BLACKBURN.—The painters at Blackburn have come out on strike in consequence of the refusal of the masters to increase wages from 8½d. to 9d. per hour. Between thirty and forty firms and 300 men are affected. Other matters, such as boundaries and the abolition of breakfast time by starting an hour later each day, are also in dispute.

* * *

THE HEATING OF HOSPITALS AND ASYLUMS.—At the meeting of the Institution of Civil Engineers held on March 31st, a paper on "Some Methods of Heating adopted in Hospitals and Asylums recently built" was read by Mr. E. R. Dolby, M.Inst.C.E. The author discussed the various systems in use, and maintained that for the class of buildings under discussion hot-water radiators were to be preferred, and that for a large institution the water should be heated in calorifiers placed at a central point, and should be forced through the mains by pumps. Mr. Dolby dealt with the installations of, or apparatus in use at, the King's Sanatorium, Midhurst (consumptives), the Royal Victoria Infirmary, Newcastle-on-Tyne (general), and Camberwell Infirmary (poor-law), the East Sussex Asylum, Hellingly (lunatics), St. Mary's Hospital, Paddington (general), and Cardiff Asylum (lunatics), and gave data regarding the consumption of coal, water, etc., in support of the views he propounded. The paper closed with a description of certain minor details of the apparatus.

* * *

LAON CATHEDRAL, in Picardy, was the subject of a paper which Mr. G. Salway Nicol read before the last meeting of the Birmingham Architectural Association. The scheme of the building is peculiarly English, inasmuch as it terminates in a square east end. In addition to the two western towers, it had also two towers at the end of each transept, which, together with the tall lantern tower over the crossing, made no fewer than seven towers, each between 200ft. and 300ft. high, and terminated by a rich arrangement of pinnacles. This wonderful arrangement has suffered somewhat in late years, but enough is still standing to give a good idea of the original building.

* * *

LONDON COUNTY HALL SITE: ARBITRATOR'S AWARD. — Mr. Samuel Walker has now made his award as arbitrator with respect to the compensation to be paid to Messrs. Holloway Brothers, Ltd., by the London County Council for the firm's riverside works adjacent to Westminster Bridge, required as part of the site for the proposed County Hall for London. Messrs. Holloway Brothers' claim amounted to £200,000. Mr. Walker's award is for £97,374.—Messrs. Holloway Brothers state that they have arranged to continue in occupation of their works and offices at Belvedere Road under a lease from the Council, and will carry on business there without interruption as hitherto.

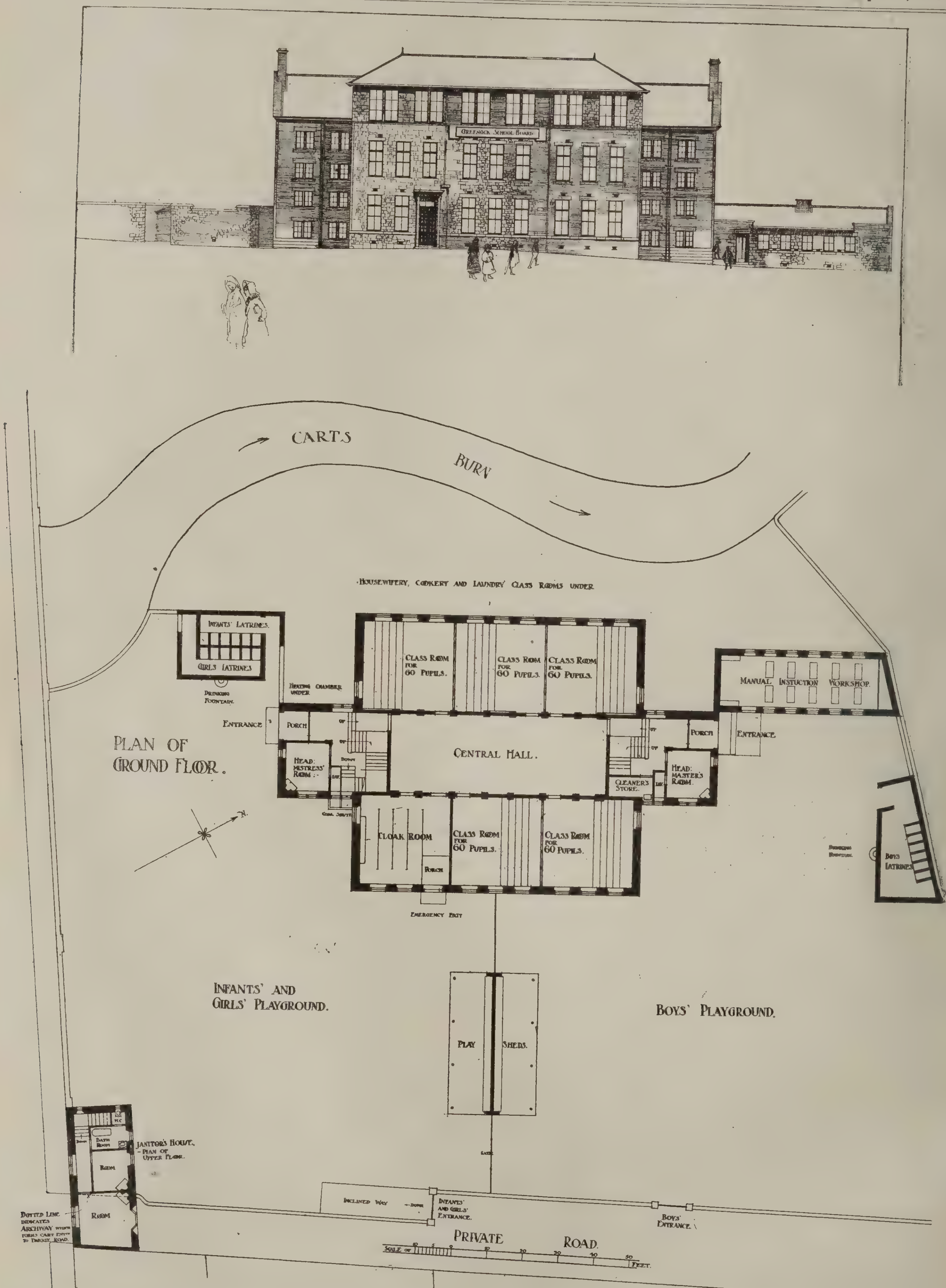
* * *

REGISTRATION OF PLUMBERS.—19 master and operative plumbers attended at King's College, London, on April 4th, from London and the provinces, for examination in the principles and practice of plumbing work for the purpose of registration under the National Registration of Plumbers. The practical examination included tests in lead bossing and joint wiping, as required for good-class sanitary work, and the examination questions were on the subject of sanitation, drainage, ventilation, and the connection of pure water to dwelling-houses. Messrs. John Knight, Joseph Johnson (master plumbers), F. Herbert and W. J. Jarvis (operative plumbers) were the examiners appointed by the Registration Committee to conduct the examination. Three candidates succeeded in passing, and were enrolled on the Register for qualified plumbers.

Our Plate.

Some Designs for Pavilions by James Gibbs.

The three designs for pavilions or summer-houses which we give this week are reproduced from the well-known book on architecture published by James Gibbs. Although they do not display the *finesse* of form and delicacy of detail that are apparent in the drawings made for similar buildings by other well-known architects—for instance, Sir William Chambers, whose garden pavilions and "temples" are models of grace and refinement— yet we think they are sufficiently suggestive of good design and proportion to prove of interest to our readers.



CARTSBURN SCHOOL, GREENOCK. SALMON AND SON AND GILLESPIE, FF.R.I.B.A., ARCHITECTS.

This school is in course of erection in the east end of Greenock. The total cost is estimated at £13,000. On the lower ground floor are rooms for housewifery classes and for cookery and laundry work. The accommodation on the ground floor is shown by the plan above. On the first floor are 6 classrooms for 60 pupils, and 3 retiring rooms (with lavatories attached) for assistant teachers. On the second floor are 4 classrooms for 30 pupils, 3 for 40, and 2 for 60. Separate cloakrooms for boys and girls are arranged on entresols between each floor. A manual workshop for 20 pupils is also provided. The architects are Messrs. Salmon and Son and Gillespie, FF.R.I.B.A., of Glasgow. The builders are Messrs. Aitkenhead and Sons. On the gable is a figure panel by Mr. A. Young.

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
The querist's name and address must always be given, not necessarily for publication.

Cement Tests.

X. writes :—"Having seen many cement manufacturers' reports of cement that has been tested at their laboratories, and the tensile strains, varying from 600 to 625lbs. per sq. in. at 7 days, I shall be glad to know what is the use of these tests, if when samples of cement are taken from the sacks as delivered on the job, and tested, the tensile test cannot rise to more than, say, 400 lbs. per sq. in."

There must be a reason for any difference obtained in the tensile strength tests of a cement if when it is tested in the factory laboratory and again on the contractor's works a reduction of some 200 lbs. per sq. in. is observed in the latter results. The difference may be due to a number of causes, and should be readily explained, but no doubt this is chiefly caused by the personal element in preparing the briquette. At the cement factory the constant gauging and intimate knowledge of the identical product under test is almost bound to show results which will be higher than the contractor's results, where some amount of experimenting must be carried out in conducting the test. If such a discrepancy regularly occurs, however, ask the manufacturer to explain, and he will doubtless outline his methods of conducting the test; or by sending a sample to any expert, both results can readily be checked as to their accuracy.

H.C.D.

White Lead Paint Turning Yellow.

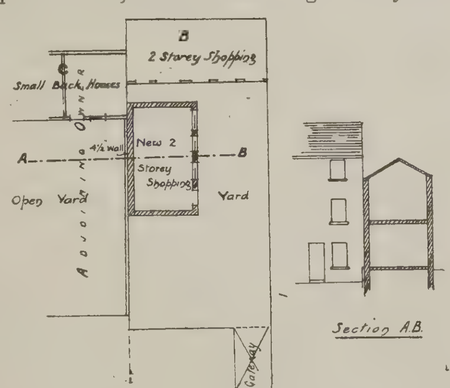
W.W.S. writes : "Pure white lead paint has been applied on the inside of a brewery, varying in number of coats, 2, 3, and 4 coats, all within eight months, some as recently as two months, and some now going on. The materials painted are—Uralite, wood and iron. A white was specially desired. It is now all turning yellow, more or less evenly. It has been suggested the 'paint is bad' (it is not contract work). The brewery expert chemist says the fumes from the brewery should not cause the change of colour. The makers of the white lead do not agree with this statement. Pending an analysis of the white lead, kindly give an opinion. Also (2) what paint (if any) can be applied over this which will remain white? (3) Would distemper stand? (4) Are the enamels (presumably of zinc base) suitable? (5) In completing the remainder of the painting, what paints would you use?"

I do not consider white lead suitable for use in a brewery. As is well known, it turns yellow or brown in the presence of sulphur, but impure gases and ammonia have the same effect. If the paint is made from pure white lead, it would be more likely to affect its colour under the influence of deleterious gases than it would if adulterated, because the usual adulterants, such as barytes, are wholly unaffected by such gases. I am afraid, therefore, that an analysis of the white lead will not help you. (2) If you give one or more coats of pure zinc oxide over the lead it will remain white. It should be bought ground in oil, and mixed with refined boiled linseed oil, turpentine being used very sparingly. The boiled oil is itself a drier, but if additional driers are necessary, be sure to use zinc driers only. Refined boiled oil is nearly water white, and will therefore not affect the colour. (3) Distemper would hardly be suitable, as it would absorb the moisture and probably leave marks. Washable distemper is also unsuitable because while it is excellent in dry situations, where the atmosphere is very humid a fungus is likely to grow on the surface which is most objectionable. (4) Any of the first-class enamels are eminently suitable for the work, provided that they are made on a zinc oxide base and not (as some are) from lithopone. The latter material is not suitable for applying to iron. Of course, the enamels will cost more than the zinc oxide. (5) If any of the work is not yet touched, there would be no harm in using white lead paint for the first coat on the priming and two or more coats of pure zinc oxide over it, finishing with enamel, if desired. If a pure white colour is desired, and it is determined to use an enamel, it would be well to give, at least, one coat of zinc oxide over the lead before the enamel is applied.

J.

Right of Light.

HANDSWORTH.—E.L. writes : "I am erecting a two-storey shop as shown by the accompanying sketch. The tenant of shop B (not the owner) has just received a solicitor's letter saying he has damaged the light of the adjoining premises C, and threatening an injunction.



As we do not encroach on his boundary in any way, nor in front of his windows, am I right in assuming that the adjoining owner has no claim on my client? Is he not entitled to build to any height he likes on his own boundary in this position?"

Unless the tenancy is one "for years," an action can hardly lie against the tenant; and no doubt the letter has been addressed to him under the mistaken idea that he is the owner. The neighbourly thing is, of course, to reply to the letter that a mistake has been made in this respect. To pass to the points raised, the question of encroachment does not arise in the least; the only thing to be ascertained being whether a serious diminution of light to C's premises has been caused by the erection of the new block of shopping on B's property. From your sketch I should be inclined to believe that this has been the case, so far as the ground-floor and first-floor windows of at least one house are concerned. Light, of course, is received laterally, as well as directly, from in front, and it becomes a matter of evidence as to whether the alteration has caused a sufficiently serious diminution of light to justify an order of demolition or the payment of damages. You do not state the age of C's houses. The rights of "Ancient Lights" cannot be acquired in a shorter time than twenty years (Prescription Act, 1832.)

F.S.I.

Cleaning Marble Mantelpieces.

BIRMINGHAM.—E.W.I. writes : "Which is the best way to clean up marble mantelpieces?"

Smoke stains on marble chimney-pieces —if not impregnated too long— can be removed by dissolving potash in water to the consistency of cream and painting the stains with a brush. It should be left on for several days, then washed off, and renewed again and again if time permits.

T.P.

Pressure Produced by Impact.

HANWELL.—H.K. writes : "I should be glad if Prof. Henry Adams would answer the following question :—An engine weighs 80 tons, and is travelling at a speed of five miles per hour, or 7.3 ft. per second. What will be the force in tons (not foot-tons) at a point in line with the centre of the boiler, the distance of buffer travel being 4 ins.?"

When a moving body is stopped, the pressure it exerts depends upon the distance in which the motion is arrested, as well as upon the weight of the body. In the case given, the energy will be $\frac{W v^2}{2 g}$ $= \frac{80 \times 7.3^2}{2 \times 32.2} = 66.3$ ft.-tons, and as the motion is arrested in a distance of 4 ins., the mean pressure produced will be $\frac{66.3}{\frac{1}{3}}$ $= 66.3 \times 3 = 198.9$ tons. This is the usual text-book method of answering, but it gives a very wrong impression of the actual facts in practice. The pressure really commences at nil, and if the resistance varies as the compression, the final pressure will be not less than double the mean = say, 400 tons. There are many cases where the resistance increases in a higher ratio with the compression (as in pile driving), and then the final pressure may easily reach to three times the mean.

HENRY ADAMS.

City Guilds Examination Papers.

CHATHAM.—A.C.B. writes :—"I should like to know where to obtain examination papers in carpentry and joinery and builders' quantities, City and Guilds Examinations, say for the years 1906 and 1907."

Examination papers set by the City and Guilds of London Institute may be obtained through any bookseller from the Central Institute, South Kensington.

HENRY ADAMS.

Houses by Mr. Voysey near London.

LONDON.—ENQUIRER writes : "Are there any of Mr. C. F. A. Voysey's buildings within a few miles of London? If so, kindly name locality and road. You have frequently illustrated some in your journal, but none that I remember near London."

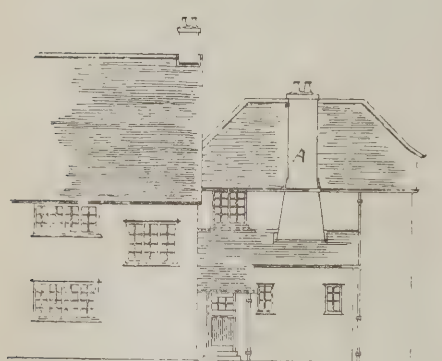
The following houses by Mr. Voysey are easy of access from London :—House at Bedford Park, Chiswick, facing the Green; house in Platts Lane, Hampstead, corner of Kidderpore Avenue; pair of houses on Burgess Hill, Finchley Road, N.W. (just completed); "The Orchard," Shire Lane, Chorley Wood (built for himself); Sanderson's Wallpaper Factory, Chiswick. Near Godalming, Surrey, are numerous examples of Mr. Voysey's work

as follows:—House on Hog's Back, house at Shackleford, Priors Garth, near Godalming, Mr. Methuen's house at Haslemere, house at Farncombe.

A Smoky Chimney.

LIVERPOOL.—H.L.B. writes: "The accompanying illustration shows a wing of a building which I have recently added on to a house. The chimney marked A smokes. The prevailing wind, and one that causes the chimney to smoke, comes

END ELEVATION.



FRONT ELEVATION.

from the north-west, and flows over the new wing against the house, from which it rebounds. I have tried all sorts of pots, and it would be a very difficult matter to raise the chimney stack, but if you could suggest anything I should be very grateful."

It is of course quite possible in this case that the down-draught caued by eddy is such that the nuisance is incurable, but your sketch does not lead one to expect such a state of affairs. From long experience I have found that the fault which causes a chimney to smoke is more generally to be looked for at the foot than at the top of a chimney stack. You do not say what kind of stoves are fixed in the rooms below, but I am inclined to think an alteration or resetting of the fireplace (and possibly a contraction of the throat of the chimney) will have more effect than all the pots and cowls that can be devised. F.S.I.

Bricks in the Southport District.

WIMBLEDON.—SUBSCRIBER writes: "Can you give me any information regarding bricks, tiles, etc., that are made, and that are within easy transit of Ainsdale, near Southport, Lancs.; also the names of makers to whom I could write?"

The following are the names of makers of common bricks in the vicinity named: Edward Bridge, Old Abbey Brick Works, Burscough, Ormskirk; the Burscough Brick and Tile Co., Ormswick; Platt and Co., Tulketh Street, Southport (office); the Hydraulic Brick and Stone Co., Hightown, near Liverpool. The last-named is close to Ainsdale, on the railway between Southport and Liverpool. The patent bricks used in the neighbourhood nearly all come from Accrington, though some Ruabon bricks are used, and they can be delivered in Liverpool at much the same price as Accrington bricks. In Accrington you might write to the Accrington Brick and Tile Co., or to the Winney Hill Brick and Tile Co. Messrs. Pearson and Campbell, of Water Street, Liverpool, are agents for several firms who make roofing tiles and would be glad to give you information.

F.H.C.

Measuring-up Stonework.

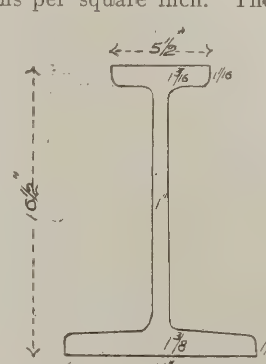
STONEMASON writes: "Can I legally sustain my charge of claiming the half-inches that occur in measuring up stonework? For instance, if a stone is 2ft. 8½ins. by 1ft. 4½ins. by 9ins., can I take it as 2ft. 9ins. by 1ft. 5ins. by 9ins? Many items similar to this occur in measuring up at the finish of an ordinary-sized job."

It is such a recognised custom to allow the full inches in measuring stonework that I should be of opinion it would be very difficult to legally object. In 30 years' experience I have never had the question raised. W.E.D.

Strength of Bridge.

POWHATTEN writes: "Herewith I give cross-section of a bridge with a span of 25ft. 6ins. The girders are cast-iron, of not very good quality; the arches are of brickwork, and the road material is of granite. The extreme depth of each girder is 16½ins. I have reported that the bridge is unsuitable for anything but the lightest cart traffic. A certain firm wishes to run 12-ton motor lorries over it. Is it not of insufficient strength for this?"

The bridge shown is already overloaded with the dead weight of the structure. The tensile stress per sq. in. in the bottom flange of the central girder being $s = \frac{WL}{8\,AD} = \frac{13{\cdot}6 \times 26 \times 12}{8 \times 13{\cdot}75 \times 15} = 2{\cdot}57$ tons, and cast-iron is not often put under a greater tensile stress than 1½ tons per sq. in. A 12-ton motor standing on the centre of the bridge would increase the stress to 4.14 tons per sq. in., but if the motor were in motion the effect of vibration would be to increase the stress to 5.08 tons per square inch. The ultimate



strength of ordinary cast-iron is 7.5 tons per sq. in.; so that the passage of a 12-ton motor across the bridge would only leave a margin of 7.5—5.08=2.42 tons per sq. in. to cover all contingencies, instead of the usual 7.5—1.5=6 tons per sq. in. In other words, the risk would be about 2½ times greater than prudent persons would take. HENRY ADAMS.

Fireproofing an Existing Floor.

GHOST writes: "I am required to make fire-proof, to meet the insurance requirements, an existing wooden floor, consisting of 2 in. by 3 in. joists and maple floor boards on 10 in. by 6 in. rolled steel girders at 12 ft. centres. I do not intend to remove this floor, and I shall be glad, therefore, if you can suggest a means of doing this, other than by iron or asbestos sheeting screwed to the underside of the joists, without in the least disturbing the floor, which contains machinery in motion."

The floor may be made fire-resisting by covering the underside of the wooden joists with Crittall's expanded cup metal lathing, plastered with Robinson's or "Adamant" fireproof plaster.

HENRY ADAMS.

Tuition by Correspondence

SKIPTON. — YORKSHIRE writes: "I am contemplating taking a course in architecture and graphic statics through the International Correspondence Schools. Kindly give your opinion of the standard of these schools."

We believe the International Correspondence Schools to be thoroughly good. See the notice on p. 230 of our issue for March 11th.

Tests for Bricks.

LONDON.—ENQUIRER writes: "Is there any method of testing stock or Fletton bricks other than by practical experience of ring, nature of the brick, etc.—I mean something similar to the method of testing slates by hydrochloric acid?"

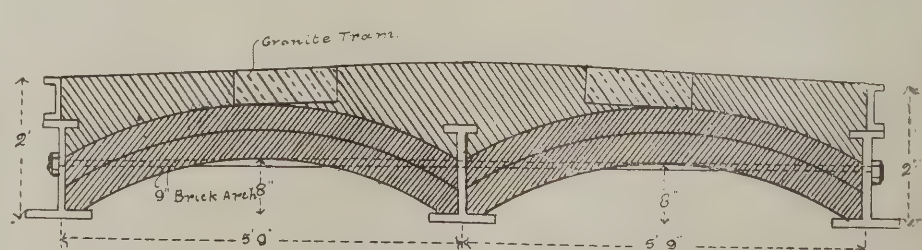
The acid test for slates merely proves, in certain circumstances, that the slates are bad, and many slates which successfully pass this test may be deficient in other respects. There is no simple and conclusive single test which can be applied to bricks, though the percentage of weight gained when immersed dry in water is a useful preliminary guide, an excessive gain at once proving inferiority; even this, however, must be qualified, having regard to the intended use, where porosity might be no disadvantage.

G.

Cement for fixing Tiled Slabs, Hearths, etc.

BIRMINGHAM.—E.W.I. writes: "Where can I get fire-resisting cement for fixing tiled slabs, hearths, etc? I assume any ordinary cement would not be a success, as it would lose its nature and perish."

For fixing hearth tiles, slabs, etc., to brickwork of concrete, Portland cement, mixed with sand, is suitable. The cement should be well seasoned and sand mixed



Cross Section of Bridge.

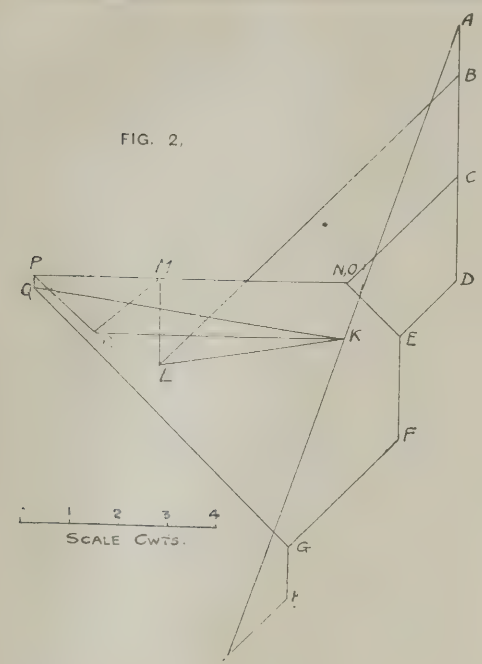


FIG. 2.

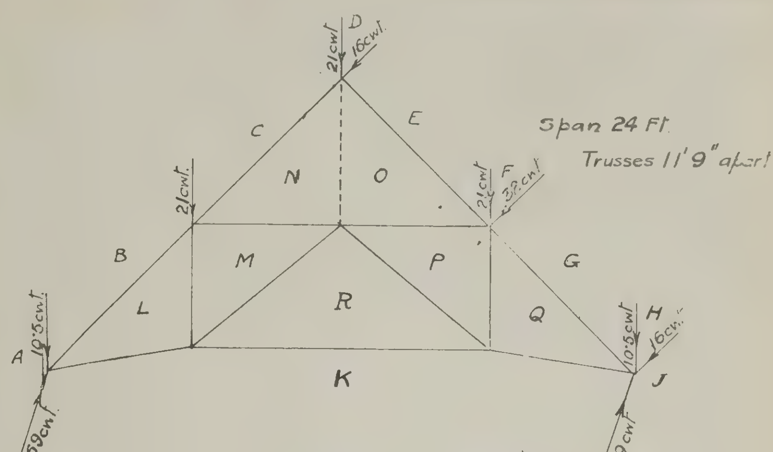


FIG. 1

therewith, not of a siliceous nature, but coke breeze, broken brick or similar substances, screened through a fine sieve and washed. The London Asbestos Co., of 101, Leadenhall Street, E.C., make an asbestos cement for this and similar purposes that will stand great heat. T.P.

Black Pointing.

LONDON.—ENQUIRER writes: "What is the 'mineral black' with which they mix black pointing, and how is it gauged?"

Black pointing is generally compounded of cement and smith's ashes, the latter ingredient taking the place of sand and being similarly gauged.

Examination Papers in Surveying and Quantities.

CHORLEY.—P.H. writes: "I shall be glad to know where I can obtain the following examination papers, say, from 1900 to 1907:—Surveying, Stage I. and II.; Builders' Quantities, Stage I. and Honours."

The writer does not know of any examinations in surveying and builders' quantities classified into Stages I., II., and Honours. Possibly the technological examinations of the City and Guilds of London Institute are referred to, particulars of which can be obtained from the secretary, City Guilds Central Institute, South Kensington.

HENRY ADAMS.

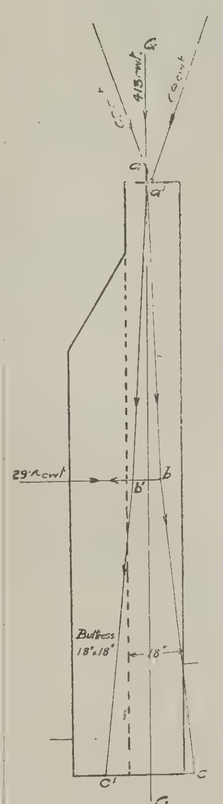
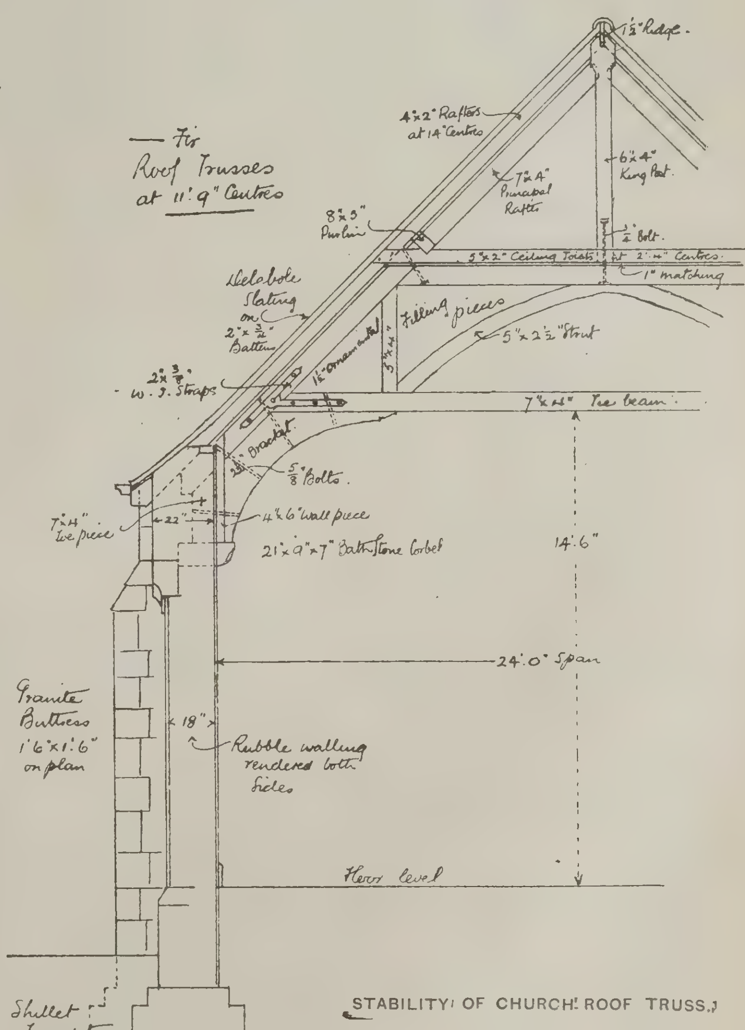


FIG. 3.



STABILITY OF CHURCH ROOF TRUSS.

Stability of Church Roof Truss.

PLYMOUTH.—GOTHIC writes: "I send sketch showing details of a proposed roof for a village church. Kindly give an opinion as to the suitability of the proposed construction."

The thrusts and stresses in this kind of roof truss can be determined only approximately. Taking the load at 35 lbs. per sq. ft. of plan, the total load is 11.75 x 24 x 35 = 112 = 84 cwts. (about), and the corresponding frame diagram comes as shown in Fig. 1, the wind-pressure being taken as 40 lbs. per sq. ft. on a vertical surface. The stress diagram corresponding thereto comes as shown in Fig. 2, each reaction working out at about 69 cwts. at the inclination shown, and each end being taken as offering equal resistance to the wind. The stress in the king post is theoretically nil, and, if desired, this might be made lighter, while the struts, M. R., P. R., might be increased to, say, 5 ins. by 4 ins., the other scantlings being ample. Considering the stability of the walls and buttresses, the combined weight per truss, allowing 150 lbs. per cub. ft., comes about 413 cwts., acting down the line GG, Fig. 3, about $\frac{1}{16}$ in. from the centre line of the wall. Taking a wind-pressure on the walls of 40lbs. per sq. ft, as being taken one-half on each side of the building, and being 29.4 cwts. each, we get the lines of pressure a, b, c, and a^1, b^1, c^1, for the wind on either side of the building. By combining the weight with the reactions we get the lines a, b, a^1, b^1, and then where they meet the lines of the wind pressure, combining with such pressure we get the lines b c, b^1, c^1. One of these lines of pressure comes outside the section, and so the walls or buttresses, or both, should be strengthened. The stresses in the walls and buttresses where W is the total vertical load, A the area, and R the radius of gyration of the section, and where x is the distance from the centroid of the base to the point where the line of pressure cuts it, are given by the formula

$$C = \frac{W}{A}\left(1 + \frac{x\,d_1}{k^2}\right),$$

$$T = \frac{W}{A}\left(\frac{x\,d_2}{k^2} - 1\right)$$

where d_1 and d_2 are the distances from the centroid to the respective edges of the section.

A.

SOME NOTES ON THE FITTINGS FOR SCIENCE LABORATORIES.*

By W. E. Cross, B.A.
Senior Science Master, Whitgift School, Croydon.

It is, of course, impracticable within the compass of a short paper to deal in detail with all the possible methods of arranging the laboratory furniture, and still less possible to discuss details in connection with fittings of a special kind, since so much depends upon the size of the rooms provided, the number of classes intended to occupy them, and the nature and standard of the work proposed. In spite of this, however, there are certain general principles to be observed, and a neglect of these may lead to the production of a laboratory, apparently perfect on a cursory inspection, yet so defective that to conduct orderly work therein is a matter of considerable difficulty; or else, as has been the case in one or two laboratories which have recently come under my notice, the system adopted, while admirably suited at the time it was planned to meet existing needs, was subsequently found to be wholly incapable of expansion or modification when new circumstances arose.

It is with this latter point, namely, expansibility, that I propose to deal chiefly and to consider a few important questions of laboratory planning and equipment from the teacher's rather than from the architect's point of view. Diverse as would be the opinion of teachers as to the position of benches and the choice of fittings, all would probably agree that no effort should be spared to attain the following five objects:

(1.) The laboratories should be capable of expansion and modification.

(2.) Fittings and furniture should be so planned as to be cleanable with a minimum expenditure of labour.

(3.) Fittings should be so disposed around the room as to minimise the unavoidable movement of pupils.

(4.) The arrangement of benches, etc., should ensure ease of supervision on the part of the teachers.

(5.) The storage accommodation should be ample and wall space should be left for additional fixtures.

These five considerations should be constantly kept in view, and no fitting should be introduced which to any great extent tends to subvert them.

Structural Points.

I will first deal with one or two points concerning the general structural nature of the building.

The laboratories should be lofty and either top-lighted or the side windows so planned that the bottom of the sash is at least 6ft. from the floor; by this means no wall-space is wasted, and the light is better diffused.

The walls should be wood panelled to a height of 6ft. to enable all apparatus and shelves to be easily fixed and easily moved; the glazed tiles so often employed, though admirable as far as light and ease of cleaning are concerned, are almost fatal when changes of fittings are required.

In addition to the ordinary green canvas blinds, perfectly light-tight blinds of the roller-shutter type should be fitted to all windows, or at least to those in the physical laboratory and lecture rooms, so that these can be readily darkened, as is so often necessary in physical work.

Great care must be taken that the systems employed for opening and closing the windows and for controlling the blinds are simple, efficient, and easy of repair.

It is perhaps superfluous to remark upon the necessity for perfect rigidity in the flooring, the ordinary system of joists and boards being quite inadequate.

The question of space will be dealt with when the question of benches is discussed. It is enough to say here that most laboratories are too small for the numbers intended to work in them.

CHEMICAL LABORATORY.

Bench Arrangements.

Fig. 1 shows a suggested arrangement for a chemical laboratory for 24 students, the double-bench longitudinal system being followed. To give this system its full advantage, the room should not be smaller than 44ft. by 32ft. Fig. 2 shows an alternative plan for classes of the same size. Three double benches are arranged transversely, and each bench accommodates eight students. This arrangement is slightly less economical of space and requires a room 48ft. by 32ft.

Single benches have the advantage that all students face the same way, and so are under better supervision, but they are very extravagant as regards space.

Wall benches are wholly bad and should be rigorously avoided. The only possible excuse for employing them would be in cases where space is extremely limited. They entirely obliterate wall space and leave no room for cupboards and other fittings.

Each pair of students will require a minimum bench space of 8ft. by 2ft. or 2ft. 2ins., or, if they work singly, of 5ft. by 2ft. or 2ft. 2ins.

Gangways between benches where two rows of students work back to back should not be less than 6ft. For a single row 4ft. will suffice. A considerable space should be left clear in front of the demonstrator's table, affording room for the students to assemble to receive, collectively, any remarks from the demonstrator.

*Abstract of a paper read before the Bristol Institute of Architects on February 10th, 1908.

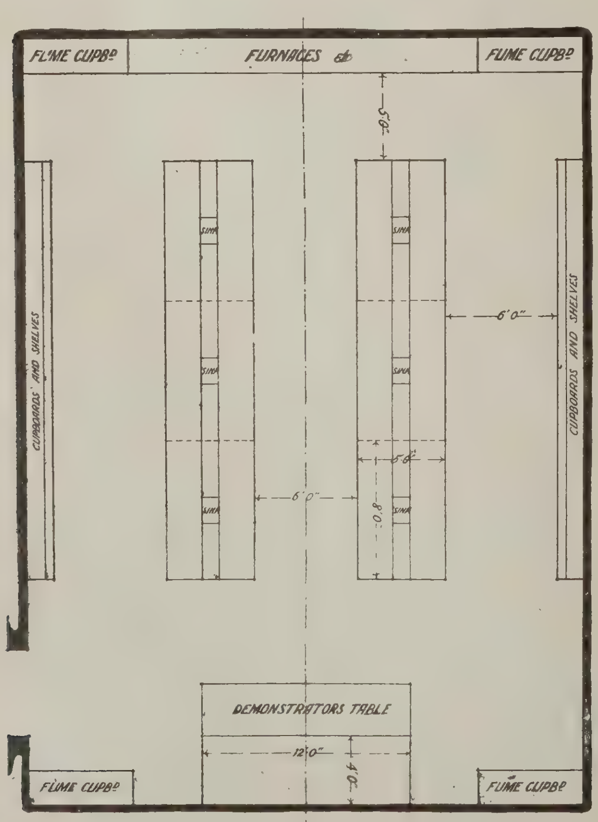


FIG. 1.—CHEMICAL LABORATORY FOR TWENTY-FOUR STUDENTS.

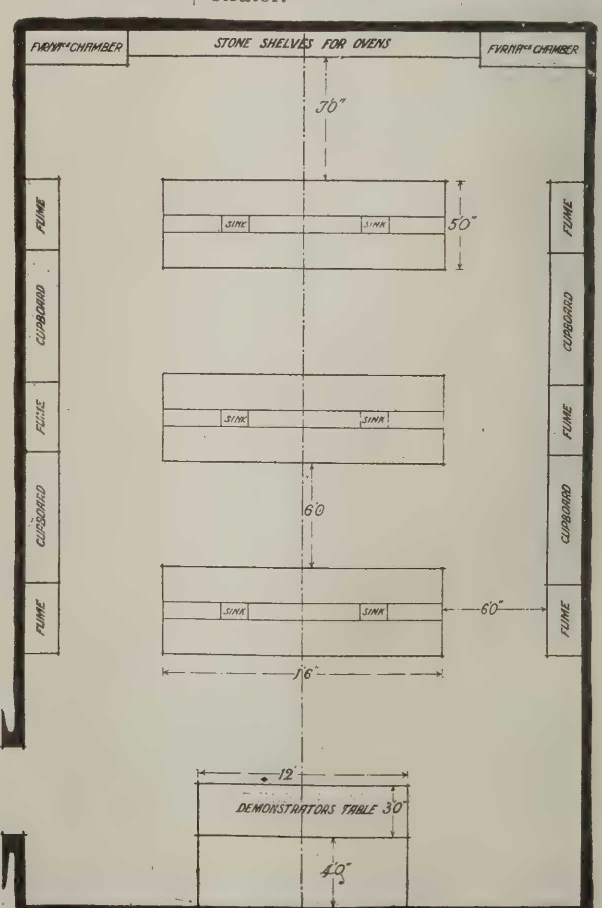


FIG. 2.—CHEMICAL LABORATORY FOR TWENTY-FOUR STUDENTS.

Symmetry.

It is a decided advantage if perfect symmetry of arrangement can be secured, as it is an aid in securing the orderly issue and disposal of apparatus and reagents, and reduces the need for movement in the laboratory. Thus, the bench sinks in Figs. 1 and 2 are common to four students, and provide precisely similar accommodation for all. Again, the fume cupboards for general use, as shown in the Figs. 1 and 2, are symmetrically disposed, so that each student would know which he is expected to use. For the same reason, reagent shelves, other than those on the benches themselves, should be placed symmetrically about the room, and not all collected into one position, so that no student has to move far to secure any reagent he may require.

With regard to the detail of bench fittings, each pair of students should have at hand one water nozzle fixed about 2ft. above the level of the sink, one side nozzle for filter pumps, etc., one nozzle for condensers, etc., four gas nozzles, terminals for electric current, one balance (in a solid and well-made case), a small portable receptacle for rubbish (broken glass, etc.), and 6ft. of shelving for reagent bottles.

It is a good plan to recess all gas nozzles, water nozzle for condensers, electricity terminals, etc., under the reagent shelves, raising them on a wood fillet from the bench level. The working space is thus entirely unencumbered and glass apparatus is not liable to be broken by being pushed against a projecting gas nozzle. The balance case can be on a shelf above the reagent bottles or arranged in a convenient position around the walls. The latter is preferable, provided it does not entail much movement on the part of the students. This can be more easily effected under Fig. 2 than under Fig. 1.

In planning the lockers beneath the bench, some regard should be paid to the maximum number of classes likely to use the laboratory. Thus, if five different classes are to use the room, each 8ft. of bench should contain five lockers. Fig. 3 shows the general arrangement of such a bench.

Drainage and Traps.

The central V-shaped trough is probably the most satisfactory. The bench sinks are usually trapped, but I am inclined to think that with a wide-bore pipe drainage is more thorough and rapid when traps are not used. Obviously Fig. 1 renders drainage simpler than does the system of Fig. 2.

I think it advisable to give a word of warning against using the benches of the stock patterns supplied by most of the firms of laboratory furnishers, as, with some few exceptions, those that I have seen are fundamentally faulty in design;

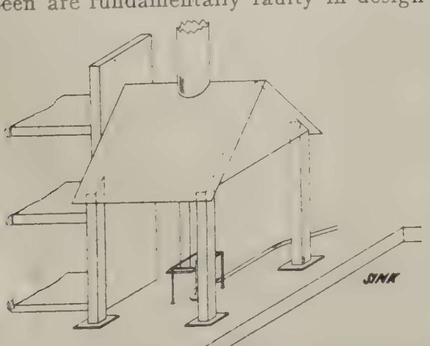


FIG. 4. FUME HOOD.

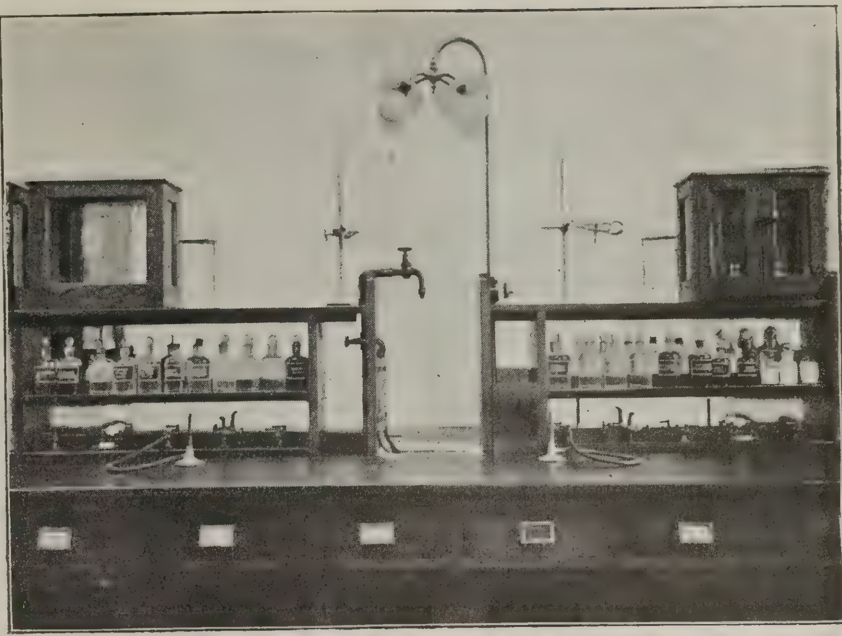


FIG. 3. CHEMICAL BENCH FOR TWO STUDENTS.

sinks are placed so as to obliterate much bench space, and gas nozzles are often fixed in inconvenient positions.

Gas Supply.

The gas pipes should be of ample bore and the pressure good, otherwise when many burners are lighted, and perhaps a gas furnace is in use, the supply will not be sufficient.

Electricity Supply.

The method of obtaining a suitable service of electricity will be dealt with later. It will suffice here to say that the same precaution must be observed as was needed for the gas supply. The cables should be capable of carrying a heavy current, even if the immediate needs only indicate the use of small ones. Since the use of the electric furnace is likely, in the near future, to be a matter of constant occurrence, one cable at least should be laid running to a furnace bench and capable of carrying 100 amperes. A suggested position for the furnace bench is shown in Figs. 1 and 2. The material should be slate or Yorkshire stone, and a good flue must be provided.

Extract on of Fumes.

The method employed for the immediate removal of noxious fumes is one of vital importance, and unless some appliance for this purpose is to be fitted to every 8ft. of bench, the supply of wall fume cupboards must be adequate, as in class work all would require to use the cupboards simultaneously. In this case 24 students would require six cupboards 2ft. 6ins. or 3ft. in length, each fitted with four gas nozzles, water supply and sink, or, what is, of course, more economical of space, a groove cut in the stone base ending in a waste pipe. Probably the best method of removing fumes from these cupboards is by a powerful Bunsen burner fixed in a vertical flue leading from each cupboard, and not by down-draught. If however, it is decided to provide draught flues on the benches themselves, 24 students would require 12 such flues, and the problem of finding a suitable means of extraction is an extremely difficult one. There is, in fact, no question in laboratory design so much in need of investigation and experiment as this. Of course, if space permits a fume hood such as is shown in Fig. 4, it can be placed amongst the reagent shelves, and if used with a vertical flue, each being fitted with an independent Bunsen burner to create a draught, the extraction will be adequate, but the vertical flue is unsightly. More often a down-draught flue is provided in the bench top with a removable hood, as shown in Fig. 5, the opening being covered when not in use with a cap flush with the bench. This, of course, would be an ideal arrangement if a really reliable system of extraction could be devised. The bore of the main extract pipe should steadily increase as it continues to receive the inlet pipes from the benches, and its final area of cross-section should be equal to the sum of the areas of all the inlet pipes; thus, if 12 inlets are provided, each of 4ins. diameter, the main pipe must increase in area up to about 1ft. 4ins. diameter, and a powerful motor fan should be fixed at its widest part.

Sinks.

The utility of the large sinks fixed at the walls can be greatly increased if they are fitted with Fletcher's water heater, draining board, and racks, and, to facilitate cleaning and to ensure a good light, the walls at the back of all sinks, fume cupboards, furnace chambers, etc., should be lined with glazed tiles or "Emdeca."

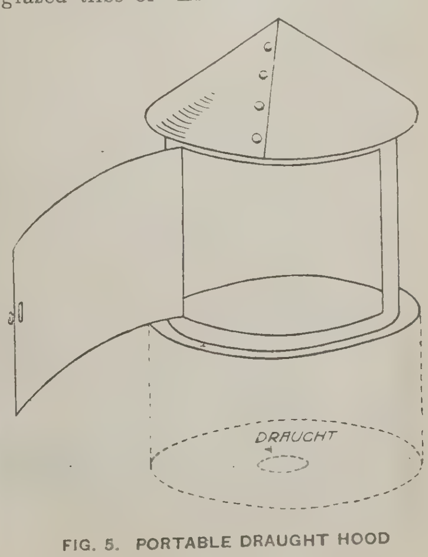


FIG. 5. PORTABLE DRAUGHT HOOD

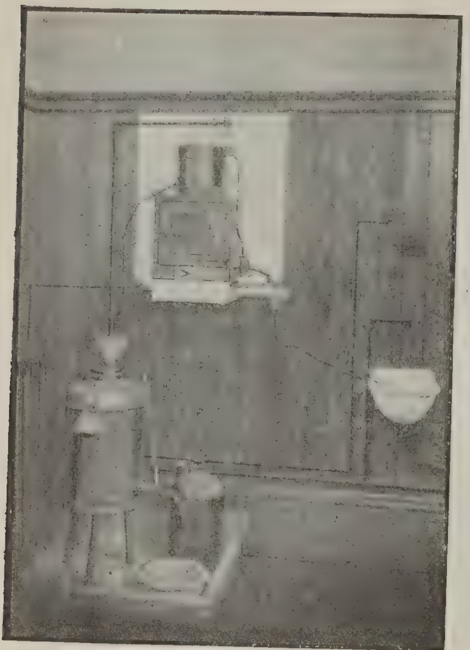


FIG. 6. STILL AND SWIVEL ARM FOR RAIN WATER.

A still and condenser is a necessary adjunct, but since the use of distilled water for all purposes involves a considerable consumption of gas and the use of a still of inconveniently large dimensions, a great saving can be effected by fixing in a convenient place in the roof a rainwater tank, and running pipes from it to various parts of the laboratory. Each pipe should end in a delivery tap, below which is fixed a ring on a swivel arm to receive a filter funnel (Fig. 6). Filtered rainwater is pure enough for ordinary purposes, and its use greatly diminishes the demands upon the still.

Balance Room.

A balance room containing a few sensitive balances is usually provided, but needs no comment. This concludes my survey of the more important points to be observed in the planning of the chemical department.

PHYSICAL DEPARTMENT.

Benches.

Turning to the physical side, we find that an arrangement of benches suitable for chemistry is often wholly unsuitable for physical work. Thus, the continuous bench is undoubtedly to be avoided, as is also the narrow single bench of 2ft. 6in. width, which many prefer in a chemical laboratory. Separate tables 8ft. by 4ft. are suitable for four students, or, where space permits, every two students could have a table 8ft. by 3ft. or 8ft. by 3ft. 6ins. It must be borne in mind that in physical work the position in which a student places his apparatus is often beyond his control, *i.e.*, a lengthy piece of apparatus may *have* to be placed east and west, or vice-versa; hence the necessity for wide benches.

A suitable arrangement is shown in Fig. 7, the space required for gangways, etc., being the same as for the chemical laboratory. When the dimensions of the room are such that the central and side gangways are impracticable, some modification, such as is shown in Fig. 8 (which represents the Whitgift School physical laboratory) can be adopted. Symmetry of arrangement is, of course, just as desirable as in the chemical department, and due care should be exercised in choosing the position of apparatus cupboards, balance cases, and all the fittings in constant use.

Bench Fittings.

It is always advisable to leave the bench top entirely unencumbered. With this object in view, gas taps, etc., are placed in a row at the ends of the table, and not on the central radiating plan so often adopted. To add to the storage accommodation, the tables are fitted with cupboards underneath. These can vary in size to suit different apparatus; some can run the whole length of the table, which has double hinged doors. The whole arrangement is shown in Fig. 9. It is by no means necessary to lay on a water supply to the students' benches, the gain being incommensurate with the loss of space and accommodation, and two wall sinks with heaters and draining boards will, as a rule, be sufficient.

Store Cupboards.

Ample storage accommodation is of vital importance, the demands of a well-stocked physical laboratory being in this respect apparently inordinate, and obviously the stock of apparatus needed will steadily increase as the work develops. It is advisable that the shelves of all cupboards should be adjustable: much valuable space is often wasted by neglect of this precaution. Some cupboards may well be fitted with narrow vertical partitions for storage of long tubes, etc., while most apparatus is more conveniently stored and is more accessible if the shelves are of small dimension from front to back. The apparently trivial details of the fittings of the store cupboards are, in fact, worth careful consideration, where space is not unlimited, and once more I would mention that the stock patterns are often wasteful of space and are inconvenient.

Every physical laboratory should contain a large stock of small drawers, measuring, say, 1ft. by 1ft. by 3ins. These are invaluable for storing the innumerable small appliances in constant use, and every drawer should have a label indicating its contents.

The catches upon the doors require attention. The ordinary bolt is often difficult

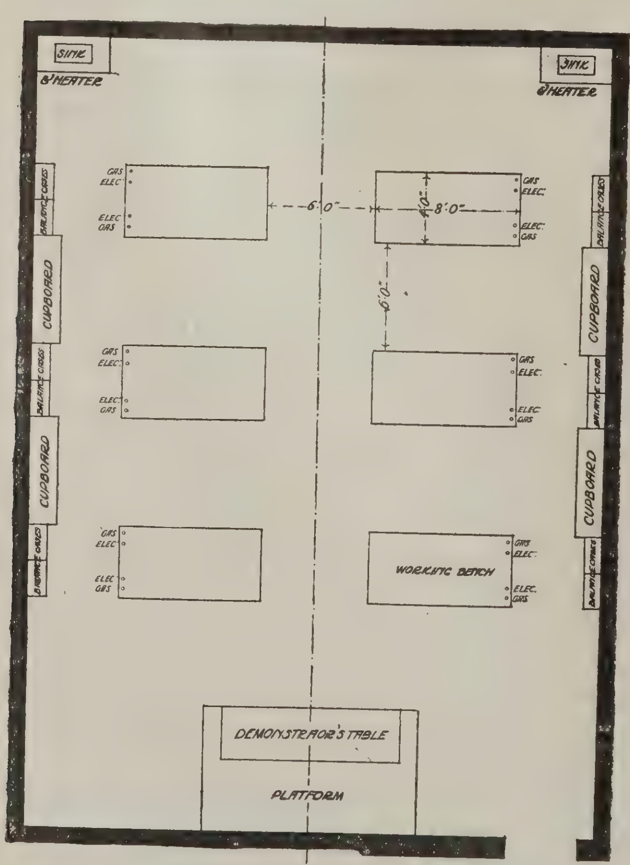


FIG. 7. PHYSICAL LABORATORY FOR 24 STUDENTS.

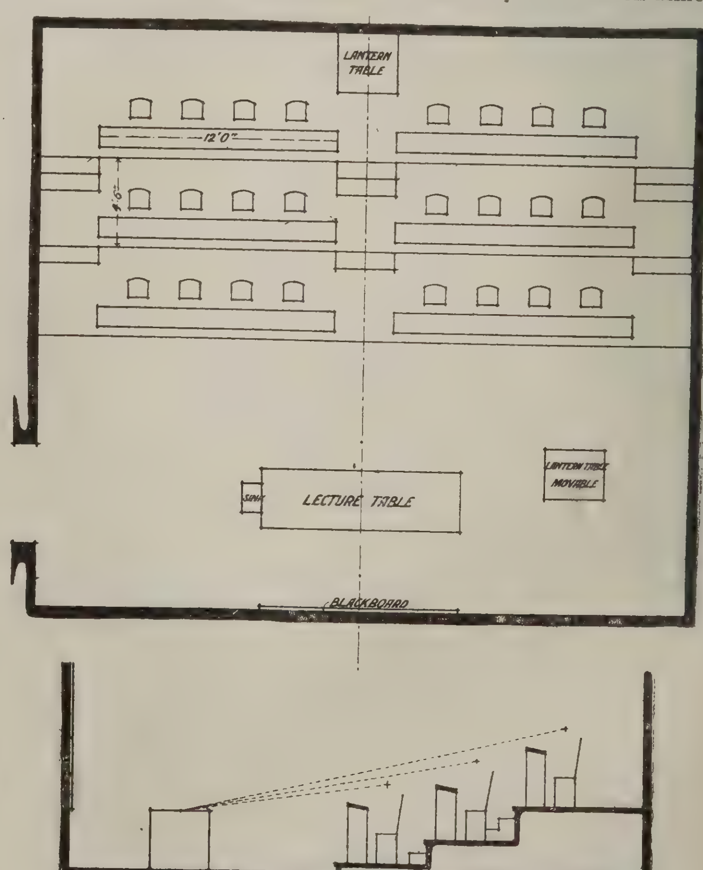


FIG. 11. LECTURE ROOM FOR 24 STUDENTS.

FIG. 8. PHYSICAL LABORATORY, WHITGIFT SCHOOL, CROYDON.

to unfasten, and leads to shaking and, perhaps, injury to sensitive apparatus within the cupboard. For this reason a lever handle is preferable to the usual type supplied, and can, in fact, be fitted with advantage to all doors throughout the science buildings.

The possibility of future development must be constantly borne in mind, and wall space left to admit of additional cupboards, shelves, and fittings.

It will materially add to the ease of cleaning the laboratories if *all* apparatus is placed under cover and not on open shelves. Cupboards should have flush, not welled, tops, and glazed doors are an obvious advantage.

Some form of drying cupboard is a valuable adjunct. The shelves and compartments in this should be perforated to allow free circulation of hot air. The source of heat can be an electric stove, as shown in Fig. 10.

Cupboards, radiators, and all fittings should be so arranged that it is impossible for rubbish to accumulate behind them; if this is impracticable, the space between them and the wall should permit of easy cleaning.

Wherever the room is lofty enough, a gallery may well be provided, which, if not needed immediately, will afford a means of increasing storage accommodation in the future.

Lecture Rooms.

There are but few points to be mentioned in the planning of the lecture rooms. The arrangement of fixed isolated seats with a continuous desk, as shown in Fig. 11, is worth noticing, as is also the space left at the back of the seats to enable a student to move without disturbing his neighbours.

A space should always be left at the back of the room for a lantern stand, and another on the right of the lecture table for the use of a lantern in optical work. A roller screen on a swivel arm may be fitted opposite to this, but on the left of the table.

It is a good plan to fit the front of the lecture table with glazed cupboards, since the space at the back is often confined and ill-lighted. If the Kelvin sliding blackboard is used, pulley wheels of large diameter should be fitted; the small ones in general use render the board difficult to move.

Electric Service.

The system employed for adapting the electricity from the supply mains to experimental purposes is all-important, and requires careful consideration from every point of view before the plant is laid down and the wiring fixed. That modifications and additions in the future will be necessary goes without saying, and no effort should be spared to render such additions possible. Wherever the current from the mains is direct, the most satisfactory system, and in the end the most economical, is the use of a motor generator combined with secondary cells. The generator consists of a shunt-wound motor (built for the particular voltage of the supply current) coupled direct to a dynamo, the output of the dynamo being about 3,000 watts. The motor should be fitted with a speed-regulating resistance, while the adjustability of the voltage of the dynamo must be further secured by an additional resistance.

On this system a generator can be designed giving a range of voltage from 50-150 volts, or perhaps 30-100 volts, which amply provides for most of the "heavy" current work that will be needed. The bulk of experimental work, however, requires a current at voltages ranging from 2 to 25. This can best be secured by fixing in some convenient position, say, twelve storage cells of considerable capacity (120 ampere hours is suitable). The current from the generator can be diverted into them for charging, while discharging leads can run to the students' benches and lecture table both from the accumulators and from the generator direct. There will thus be assured a range of voltage from 2 to 100 or more, while the connections can be so arranged that the battery current at any voltage within its limits of 2 to 25 can be used at one set of terminals simultaneously with the generator current at 25 to 100 volts at the other. The system of storage cells as a fixture is vastly preferable to the use of primary batteries, or even to portable accumulators. The connection of the cells should be arranged so that any individual cell can be charged or discharged independently of the others, otherwise an undue demand will be made upon the first few cells of the series.

It is important that the wires should be accessible and not embedded in the walls. While the wires from the generator to the furnace benches should be capable of carrying 100 amperes, wires to the arc lantern should have carrying capacity of 20 amperes, while for the battery wires a 10-ampere capacity will be ample. It is probable that in the future no service will

STVDENTS BENCH SHEWING DOVBLE HINGED DOORS & POSITION FOR GAS TAPS & ELEC: TERMINALS

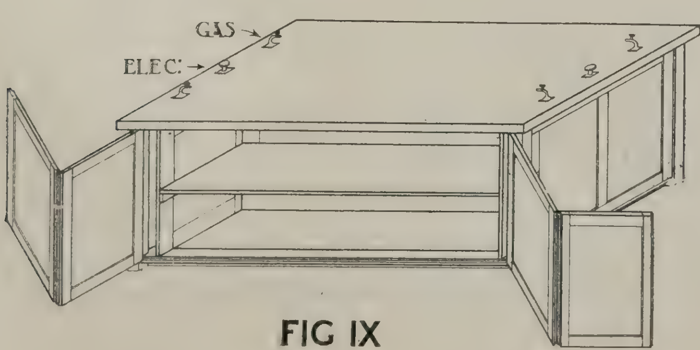


FIG IX

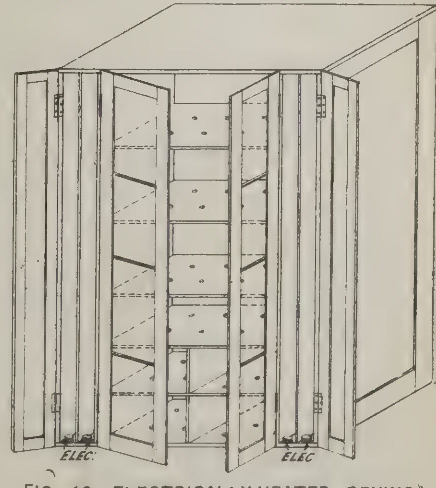


FIG. 10. ELECTRICALLY-HEATED DRYING CUPBOARD.

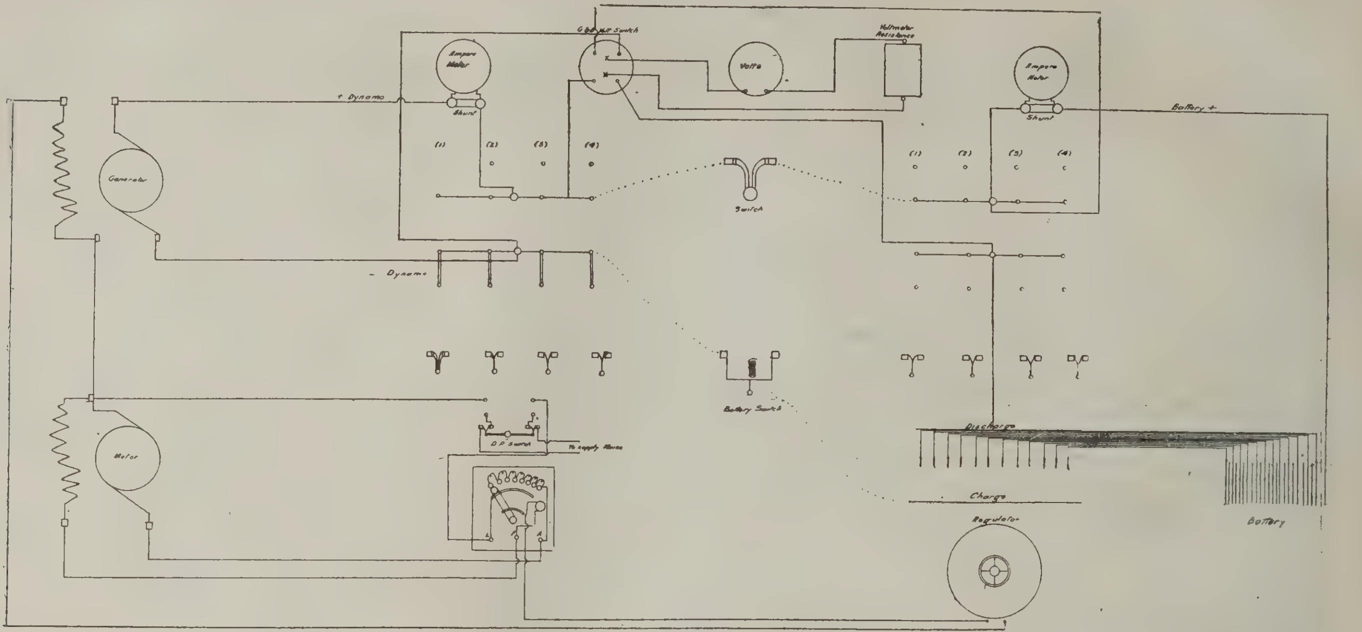


FIG. 12. WIRING FOR ELECTRICAL SERVICE IN PHYSICAL LABORATORY.

be complete which does not include the alternating as well as the direct current, and provision should be made that this additional plant can be added without structural alteration of the original. The whole system must be well protected with fuses; in fact, each pair of terminals in the benches should be so protected, in order that in the event of a short circuit at any working bench the work at the others may not be interfered with. "Series" wiring for elementary quantitative work is a valuable addition to the ordinary "parallel" system. If a controlling and regulating switchboard can be fixed in each laboratory and lecture room so much the better, but where this is impossible, on account of expense, the physical lecture room is generally the most convenient site for the main regulating board. Of course, the whole question requires careful consideration down to its minutest detail, and I can only indicate a few of the more important features to be observed, and of these "expansibility" is the chief. Fig. 12 shows, very diagrammatically, a suggested scheme.

There is but one further point to which I wish to allude. In the case of laboratories for small schools, where it is not possible to provide spacious lecture-rooms and laboratories, it is usual to arrange for a *small* laboratory and a *small* lecture room. It is, of course, a matter of opinion, but personally I think that one large room is greatly to be preferred. A glance at Figs. 1 and 2 or Fig. 7 will show that a comparatively small increase in length would enable seating accommodation to be placed in front of the lecture table without interfering in any way with the practical working arrangements of the laboratory. In fact, in one or two respects, the combined room has distinct advantages over the separate system, as lecture work and practical work can then be undertaken as occasion demands, and without creating difficulties in the matter of school time tables.

A NEW BOOK ON STONE QUARRYING, by Mr. Allan Greenwell, A.M.I.C.E., F.G.S., and Mr. J. V. Elsden, B.Sc. (London), F.G.S., is to be published shortly by the Chichester Press, 30, Furnival Street, E.C.

IMPURITIES IN AIR.

Some Interesting Experiments.

At the recent annual meeting of the Manchester and Salford Sanitary Association Mr. W. Thomson gave an interesting address in which he described a series of experiments he had made to ascertain the amount of carbonic acid gas in the air of Manchester and in various buildings under various conditions, and also on the percentage of carbonic acid gas in the exhalations of people who had breathed different kinds of air. Mr. Thomson was led to make these experiments by a request of the Association that he would bring forward some simple device for estimating the quantity of carbonic acid gas in public and other buildings. The method he recommended was that of forcing air into a bottle with an ordinary pair of bellows and submitting it to a simple chemical test.

Foul Air in Schools.

Mr. Thomson gave the results of the analysis of air taken in a number of schools in and near Manchester. For purposes of comparison, he took the amount of impurity that is accepted as permissible in buildings, namely, 6 parts of carbon dioxide in 10,000. Samples of air taken in Macclesfield schools by Mr. Horsfall contained 1.4, 3.5, and 6.1 parts of carbon dioxide in 10,000. Air taken in some Manchester schools yielded proportions of carbonic acid gas as follows:—St. Matthew's, Deansgate (boys), 11.2; St. Stephen's, Hulme, 14.9 (girls) and 11.7 (boys); Crumpsall Lane School, 12.8 in one room and 8.3 in another; whilst in a school at Openshaw there was 18.2 in the boys' room and 11.5 in the girls'. In the Technical School there was 6.5, this building being, Mr. Thomson said, one of the best-ventilated in the city.

Results obtained in a Church, Theatre, Concert Hall, etc.

In a Methodist Free Church near Manchester the air after service contained no fewer than 44 parts of carbonic acid gas per 10,000 volumes.

Tests made in a large concert hall in Manchester showed 5.2 before a performance and 11.2 after one hour and a quarter: while the carbonic acid gas in the air of one of the Manchester theatres before the performance was measured as 5.9, and after the performance, in the dress circle, 19.2.

Tests in the Manchester Art Galleries gave 10.3 in one room and 8.6 in another. Three railway compartments yielded 12, 5.6, and 21.5. Air in a Manchester tram 7.2. Old-fashioned houses with low ceilings in the country gave figures ranging between 5.6 and 12.5; new houses between 5.9 and 10.4, and a good-sized room that had contained 4 persons, with three gas jets burning for one hour and a half, 22.

Determining the Amount of Carbon Dioxide.

From these tests Mr. Thomson proceeded to determine the amount of carbonic acid gas exhaled in the breath of different people under different conditions. In books on physiology the amount was stated to be about 4 or 5 per cent., and Mr. Thomson's experiments showed these figures to be correct in general, though the amount of carbon dioxide breathed out depended upon the quality of the air by which a person was surrounded. The temperature of the air also affected the result, air heated to 140 degrees C., when breathed, having given 5.4 per cent., whereas exhalation of ordinary unheated air from the same person gave 4.4. The average in a number of experiments gave 4.1 from ordinary air and 5.2 from heated air.

The Qualities of Dry Air.

Experiments were also made as to the effects of dry and damp air, and it was discovered that thoroughly dried air has a much more powerful oxidising influence on the blood than air that has not been dried, and that this effect is increased by heating the air. This, Mr. Thomson suggested, was an important fact to consider when arranging the ventilation of buildings. Many people had noticed, he said, that the air of the House of Commons had a peculiarly flat taste. It was not invigorating and the people who sat in the House suffered considerably from influenza. This was due to the fact that the air forced into the House was washed by water. If it were passed through strong vitriol or some substance that would absorb the moisture the air would be much healthier and pleasanter to breathe. These remarks applied also, he said, to the ventilation of the Manchester School of Technology.

FIRE-RESISTING CONSTRUCTION SECTION.

(MONTHLY).

THE FIRE AT DRURY LANE THEATRE.

The fire at Drury Lane Theatre on March 25th last was the most notable of its kind that has occurred in London for many years—the most notable, in fact, since the burning of the Alhambra Theatre. London has fortunately been very free from theatre fires, and from serious fires, during the last decade: the Grand Theatre, Islington, and the Cambridge Music Hall fires alone standing as interesting examples.

The fact that the Drury Lane fire was limited to the stage speaks well for the general precautionary measures adopted by the theatre management, as also for the Fire Brigade and Salvage Corps, both of which forces did good work on this occasion.

The building is an old one, and the stage carcase in particular has seen but little alteration of late years. It is, however, an eminently substantial one, of sound brickwork, much of the old woodwork and artificial stage equipment having been cleared away.

Description of Stage.

The stage comprises a main stage and a back stage, behind which comes an intermediate store, and then the various shops and stores. Below the floor of the main stage there is an elaborate equipment of modern mechanism, comprising a pair of electrical stage bridges of the Sachs type, and another somewhat older pair, of the Vienna hydraulic type. Above the stage door level, however, much of the old system of working remained, although a certain amount of wire and pulley work had been applied in the place of the old rope and windlass equipment of the early days. The roof was a comparatively light one, supported by timber trusses, and had plenty of glazing in it. Some of the "flies" were old timber ones and some new, of metal.

The stage was shut off from the auditorium by a large fire-resisting curtain, whilst at the back of the back stage it was shut off from the intermediate store by a small fire-resisting screen (or curtain) and a number of iron doors (one of which was open at the time of the fire). The intermediate store, in its turn, was shut off from the scene stores by tin-clad doors, and this intermediate store was top-lighted.

The Fire Curtain.

The curtain in the proscenium opening was by no means a recent one, having been erected, in fact, about ten years ago by Messrs. Merryweather and Sons, Ltd., under some London County Council requirements and the Fire Office rules of the time. It had seen the usual wear and tear of a curtain of this description, and showed quite a number of stitches and patches where it had been torn and repaired.

It is this curtain, however, that to some extent made it possible for the fire brigade to save the auditorium from being gutted, for it fortunately happened that the curtain was down and it was possible to play upon it with water from the auditorium side, whilst the smoke vents to the stage let the expanding gases into the open, and thus prevented their forcing the curtain into the auditorium, as might have been expected with so large a curtain if the roof vents had not acted properly.

It is said that it was not until after the fire brigade had arrived that the drenchers fitted over the curtain were turned on, and it is doubtful whether these drenchers actually came into operation at all, as it would almost appear as though they were broken during the fire by a falling weight.

With regard to the construction of the curtain, the accompanying illustrations speak for themselves. The curtain, certainly did every credit to the makers, as it withstood the fire so well. The large tear in the wire-wove asbestos cloth covering shown in the view on the next page was not even made during the fire, *i.e.*, not until the fire was out—that is to say, after 8 a.m. on the day of the fire.)The fire started about 4 a.m., but was well in hand by 6.30 a.m.)

The Asbestos Screen at the Back.

A further point of technical interest is to be found in the small asbestos screen of similar construction between the back of the stage proper and the intermediate scene store. This screen was down, and although the fire spread into the intermediate store by some other route, *i.e.*, partly by some doors which were open and partly by the skylight, the screen not only stood up against the fire on the stage side, but also against the flames on its rear face. Circumstances prevented this small curtain (see p. 322) from being a fire stop, as in the case of the big fire curtain; that is to say, the fire passed into the part it was intended to protect by another route; nevertheless, it did its work wonderfully well, and technically is perhaps the most remarkable example of its kind.

Doors

Some of the armoured doors between the intermediate store and the scene stores behind also did their work well, *i.e.*, helped to stop the fire from spreading, but they only had small temperatures to

Photo: Topical Press.
GENERAL VIEW OF DRURY LANE STAGE AFTER THE FIRE, AS SEEN FROM THE BACK STAGE.
(Note roof trusses and "flies.")

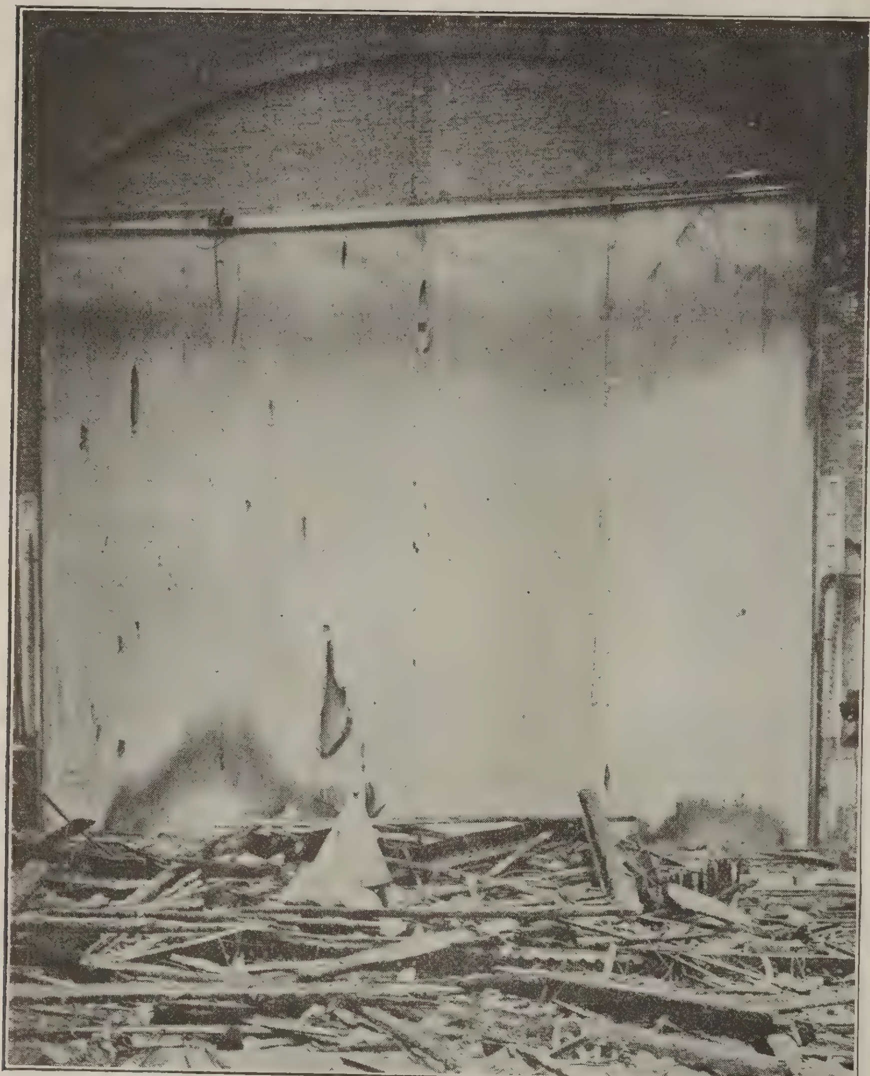


Photo: Topical Press.

THE FIRE-RESISTING CURTAIN TO THE PROSCENIUM OPENING, AS SEEN FROM THE BACK STAGE.
Note: The tear in the lower part of the curtain did not occur until the fire was out.

doors, however, they do not teach us much in this particular fire.

The contents of the stage and the temperature attained were below what is generally expected in a theatre fire, and so in some respects the deductions made are affected thereby. It is, in fact, creditably asserted that in this particular case the fire happened to be such that the curtain did not play as material a part as generally ascribed to it. The paintwork, hose, scenery, etc., on the stage, certainly proved that the temperatures were exceptionally low in certain parts of the stage.

It was fortunate that most of the scenery hung from the gridiron had been dismantled a few days before the fire, the pantomime season having come to an end about a week previously. The fire would certainly have been far more severe had the scenery been in position, especially if the whole stage had been full of the heavy "built-up" pantomime scenery for which Drury Lane is noted.

The Roof.

Regarding the roof, the glass broke immediately, and the openings acted as vents, as intended. The whole of the stage during the fire may be compared to one vast flue of, say, 75ft. by 50ft. area to about 90ft. height, and the fact that no great quantity of scenery was present accounted for the small amount of burning material that was thrown up and out in the air on to the adjoining roofs.

General Conditions of the Fire.

Altogether, the circumstances of the fire were also favourable for the work of the fire brigade. For instance, very soon after the fire started it was practically daylight; it was a damp morning, the building was unoccupied, the surrounding thoroughfares were clear of market business, the stage was comparatively empty, and the curtains were down.

These happy circumstances, however, in no way detract from the wonderful success of the fire brigade in handling this contend with, and were at no time under any serious strain. A single-sheet of asbestos cloth or an ordinary hardwood door would have done the same duty.

As has been indicated before in these columns, we are no admirers of these tin-clad doors. We consider them entirely unreliable under severe fire strain, and much prefer other forms of doors, but they are able, of course, to withstand slight fire, and especially fire that is not of a high temperature, for short periods. Directly the temperature is high, the soft wood in these doors carbonises, gases are formed, and the tin plates burst off. This has been repeatedly shown in official fire tests and in actual fires.

In this particular case of the intermediate store there was, as a matter of fact, very little bulk of material to burn, and the fire was a comparatively cool and well-ventilated one. The iron doors (and there were several of them) between the back stage and the intermediate store (p. 321) seem to have done their work fairly well—a matter which, however, must also be attributed to the fact that the fire, though of considerable volume, was not a very fierce one, nor of high temperature, even on the stage side upon which these doors faced. They buckled, as was natural for the poor type of construction and absence of sufficient fastenings on these doors. Like the armoured

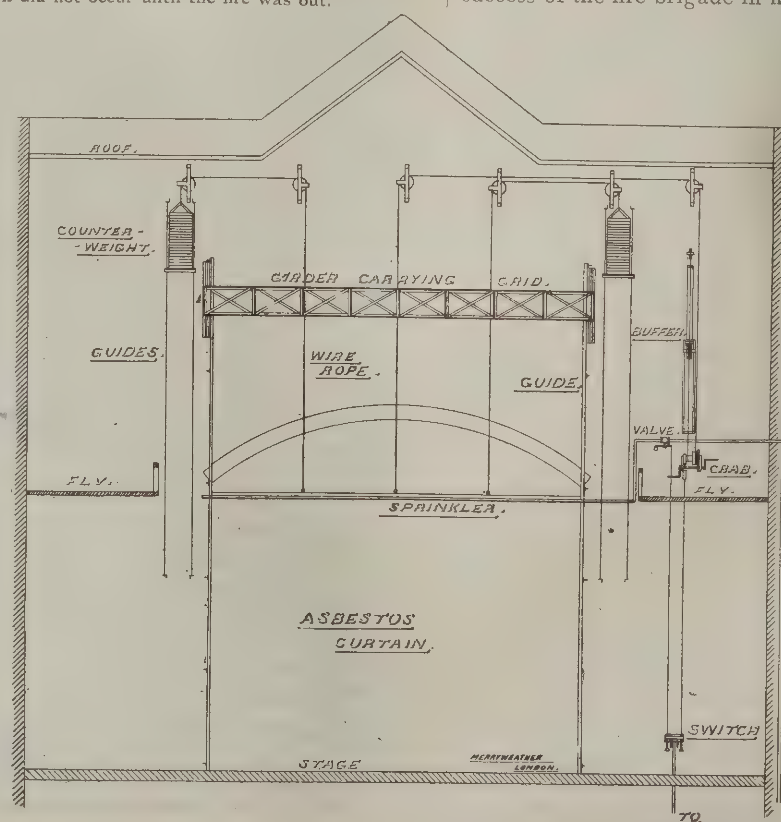


DIAGRAM OF FIRE-RESISTING CURTAIN AT DRURY LANE THEATRE.

fire. They were literally all over the building within the shortest space of time imaginable. They had a happy way of protecting everything that might possibly catch fire, and this regardless of the fact that they had so large an area of flame and a great height of building to deal with. The official report says that only 177 firemen and 60 salvage corps men attended the fire. This small number makes the work all the more creditable.

The Private Appliances.

Of the private appliances intended to facilitate the fire-fighting, the private hydrants, etc., were found in good working order, as were also the telephone wires between theatre and fire station.

the lines one would expect—that is to say, the nature of the fire was not immediately described in the call. It is, in fact, quite clear that where the personal element had to come into force valuable minutes were lost.

It will thus be seen that the personal element must be considered a very dangerous element, even in so well managed a theatre as Drury Lane, and that anything that can be done automatically should be so done to reduce this risk. In other words, it is to be regretted that the drenchers did not take the form of automatic sprinklers, and it is also to be regretted that there was not an automatic fire-alarm system on the stage. We believe it would carry an insurance rebate with it.

Generally.

The teachings of this Drury Lane Theatre fire are, however, entirely favourable to the metropolis. London can be proud that it has again been saved a grave disaster in its theatre fires.

The Reasons for the Good Results Shew at this Fire.

It is well to analyse the causes which led to such excellent results as those obtained on this occasion. In the main the causes were the incessant propaganda for theatre safety between 1890 and 1900, culminating about 1897 with the controversy that raged around the Paris

Armoured doors dividing scene store from intermediate store.

Iron scenery doors between back stage and intermediate store.

THE DRURY LANE THEATRE FIRE.

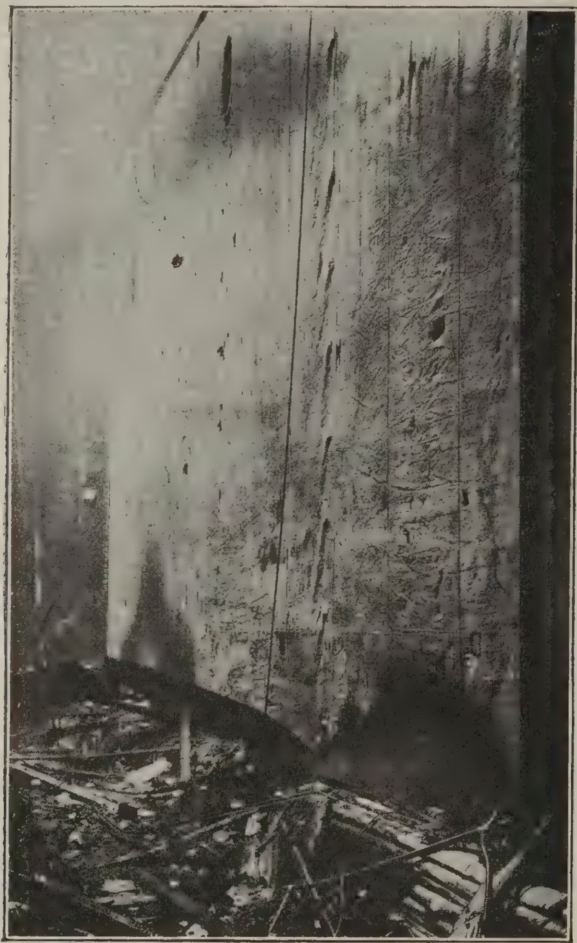
The Risk of the Personal Element.

The personal element did not shine at its very best, for the fire, it is stated, was accidentally discovered from outside by a policeman, though there was supposed to be a watchman on duty and alert in a watchroom within about 20ft. of the outbreak. The fire had made such headway before it was seen from the outside that it was well alight before the policeman could call the watchman's attention to it. Again, so far as the personal element is concerned, as stated, the watchman does not appear to have put into operation the drenchers fitted to the curtain, which was obviously one of his first duties. He did, however, utilise the special theatre telephone to the fire brigade, though here, again, the call does not appear to have been quite made on

are well aware of risk of water damage on a stage where sprinklers are installed, and we also know that the automatic calls occasionally fail. Nevertheless, they are strongly recommended for such cases.

Similarly, we would add that it would almost be better if the private wire from the theatre to the fire station were not only in the form of a telephone, but in the form of an automatic fire-alarm supplemented by a telephone. We have seen fire-alarms in connection with automatic gear where the general position of the fire is recorded when the alarm is given; that is to say, all the stage automatic call-points ring up one signal at the fire station, whilst all those (say) in the foyers ring up another signal. This matter calls for development, and we

Charity Bazaar Fire. "Fires and Public Entertainments," dealing with that fire, was published in 1897, and set out the terrible effects of the many theatre fires of the world. The public authorities were stirred up and, one among others, the London County Council (who had long done good work) showed considerable energy. The efforts on the part of the Council to obtain an improvement in theatres generally at the turn of the century have borne fruit. Their work was based on the best writings available at the time, and if occasionally we think a good many of the requirements or "requisitions" of the London County Council have been exaggerated, such excessive requirements must be regarded merely as fighting demands, as distinct from practical ones, and a readiness to meet



THE FIRE-RESISTING CURTAIN TO THE PROSCENIUM OPENING: VIEW FROM STAGE (O.P. SIDE).

Photos: Topical Press.

THE ASBESTOS CLOTH SCREEN BETWEEN BACK STAGE AND INTERMEDIATE STORE.

the practical requirements has mostly seen the exaggerated ones relegated to oblivion. Drury Lane, however, in particular, was the object of a pitched battle between the London County Council and the owners, and we think that the decision of Mr. John Slater, F.R.I.B.A., on that fight—for the matter was referred to arbitration—not only most equitable, but one that has proved to be eminently practical by the occurrences of this fire.

The requirements of the County Council, as modified by the arbitrator (Mr. Slater) we present in this issue under a separate heading, for they are interesting reading on this occasion. The modified requirements were all carried out to the satisfaction of the arbitrator, and the reward of the management for doing this work promptly when ordered under the arbitrator is perhaps found in the fact that the owners did not lose the whole of their property, but only a very small part of it. As a matter of fact, the direct loss is estimated at £13,000 (mostly covered by insurance), of which sum about £5,000 may be allotted to the contents (at least, this is what that reliable insurance journal, the "Post Magazine," states).

At the same time, however, it should not be overlooked that the execution of safety requisitions is an enormous hardship to owners of old theatres, whether in a small way of business or of such calibre as the Drury Lane proprietors, who had to incur an enormous expenditure in bringing their building into line with modern requirements. It was a hardship to others as well as to the owners, as during this period of reconstruction and improvement there was little work for artiste and stage-hand alike. Of course, there was no dividend for the shareholders, or bonuses for the directorate—in fact, such work of reconstruction must have been a most serious financial problem to meet.

So if safety is obtained, and the fire area is limited, it is only right to remember the work this meant for the authorities concerned, and for the arbitrator, as also the financial sacrifices and anxieties the owners had to face to meet these demands of up-to-date fire protection in the interests of the public.

Lessons of the Fire.

Positive lessons are to be learned from this fire regarding the effective ventilation of the roof, and, to a certain extent also, as to the efficiency of fire-resisting curtains. These lessons should give the public a feeling of greater safety in theatres, the more so as we understand the smoke in the auditorium was at no time great, and neither fire nor smoke appears to have passed through the curtain to any extent.

The lessons must, however, now still be learned in the provinces, where theatres are indeed still in a bad way in many places. In some cities important precautionary steps have been taken, notably in Liverpool and Glasgow, but the large majority of theatres in the provinces are still beneath criticism in the matter of systematic fire protection, and unless efforts are made to remedy these defects we shall one of these days have a repetition of the great catastrophe at Exeter.

Formerly it was the custom of theatre managers (other than the exceptional man of modern ideas) to scoff at such an appliance as a fire-resisting curtain, but at all events they will not be able to do so after the Drury Lane example of efficiency, and the utility of most of the precautions finally adopted at the instance of the London County Council might be considered in the same light, for there are few (if any) of them that are open to serious criticism.

We trust the time will come when the theatre rules of the Metropolis, adapted for provisional requirements, will become a building law for the country, and the sooner this takes place the better for the safety of life in theatres generally.

THE L.C.C. OFFICIAL VIEW OF THE FIRE AT DRURY LANE THEATRE.

At last week's meeting of the London County Council the Theatres Committee made the following statement:—"We have to report that the stage portion of Drury Lane Theatre, with the exception of the enclosing walls, was almost wholly destroyed by fire in the early morning of March 25th, 1908. The fire brigade was notified of the fire by telephone at 4.27 a.m. The fire curtain, which is composed of two sheets of asbestos cloth on an iron frame, but is not packed with slag-wool or silicate cotton, as is the case with the curtains at new theatres, was down when the firemen arrived at the theatre, and although it buckled slightly with the draught from the auditorium, it enabled the brigade to restrict the fire to the stage portion.

"The armoured doors in the theatre also withstood the fire satisfactorily, but the solid iron doors buckled.

"We have since visited the theatre, and we were greatly impressed by the clearness with which the result of the fire demonstrates the value of some of the principal precautions against the spread of fire insisted upon by the Council in places of public entertainment.

"There were engaged at the fire 177 officers and men of the London Fire Brigade, with 26 engines, 2 fire escapes, and numerous other smaller appliances."

Of the above formal statement, the point brought out that a stronger form of curtain is now being used calls for notice. We are not so sure, however, that this new type is an improvement. It has disadvantages as well as advantages.

With regard to the reference to the armoured doors, as stated elsewhere, we agree they did their duty, but solely under conditions of such a modest character that no deduction of the nature intended by the statements could fairly be made: in fact, the statement as made is quite misleading.

With the last clause but one in the statement we fully concur, and the Council merits great credit for its work, *i.e.*, the work of both the Superintending Architect's department, which is structural, and that of the Fire Brigade's Inspection branch, which affects the maintenance of theatres and their equipments.

THE FIRE OFFICE RULES REGARDING FIREPROOF CURTAINS 10 YEARS AGO.

The following Fire Office rules, either as printed or as put verbally, were in force when the fire curtain at Drury Lane was constructed, and they show considerable foresight:—

(1) All curtains must be of fireproof construction and particulars submitted to and approved by the Offices.

(2) The curtain must project at least 9ins. beyond the proscenium opening.

(3) When the curtain does not pass through the stage flooring on to proscenium wall the brickwork must be built up in contact with the underside of floorboards of stage.

(4) The gear for lowering the curtain must be accessible from the stage and from the outer stage entrance door, or other point in the theatre approved by the Offices.

(5) The curtain must be lowered immediately after each performance and be kept down at all times when it is not required to be up for performances, rehearsals, or other special purposes.

(N.B.—In London, the County Council require it to be used as the drop curtain.)

Except when policies are granted to mortgagees or ground landlords, warranties are to be inserted in all new policies to meet the above requirements, and also that the gear apparatus and curtain will be kept in thorough repair and working order.

THE LONDON COUNTY COUNCIL AND DRURY LANE THEATRE.

In order to fully realise the position taken up by the London County Council in respect to Drury Lane Theatre, and at the same time to afford some information as to what is sometimes necessary in the case of old theatres, we give herewith a list of "requisitions" served upon Drury Lane Theatre in 1904 at the instance of the London County Council, and with the consent of the Home Office and other authorities (Drury Lane being a "patent" theatre).

These requirements, though in themselves a most remarkable list, must be considered supplementary to the various requirements that had previously been made from time to time by the London County Council, and again previously by the Metropolitan Board of Works, in respect to the building and its safety, and they must also be regarded as supplementary to a considerable number of improvements which have been undertaken by the Drury Lane Theatre Co. on their own account from time to time, on their obtaining the lease from the Duke of Bedford some 10 years ago, and by the late Sir Augustus Harris during the time that he was lessee.

If the execution of all these earlier requirements be added to improvements voluntarily made and read with the list which we now present, it will indeed be seen how great the work is of bringing an old theatre up-to-date, and what an enormous expenditure is incurred thereby. We very much doubt whether £50,000 would cover the expenditure of these various improvements in the time of the present company and the late Sir Augustus Harris; and to such improvements must be added one not the last important, though not specifically required, namely, that of modernising the lighting arrangements by the introduction of the electric light. The lighting arrangements in particular, which involved the substitution of gas by electricity throughout, must count for much where the safety of the public is concerned.

With regard to the particular requisitions, which number 143, and which were referred to arbitration, it would be well to immediately observe that the arbitrator, Mr. John Slater, F.R.I.B.A., required 92 of these to be complied with in their entirety, that 27 were ordered with modified detail, 4 were advised as desirable, 5 were left for future settlement, 1 was not subject to decision, and finally 14 only of the 143 requirements were not confirmed. Those 14 were Nos. 21, 29, 30, 31, 33, 34, 48, 73, 95, 108, 109, 133, 139, and 140, of the schedule given below, which has been taken from the public records of the London County Council's meetings of 1904.

But how seriously the matter was considered by the arbitrator will be realised that even when not determining on the full number of the requirements, he decided on an additional one of his own, namely, that of providing four staircases in place of the two mentioned in the Council's sealed notice. He also confirmed specifically No. 97 requisition as to the fire-proofing of the stage.

If we are rightly informed, besides executing the work, which we believe figured at £20,000 or more, the owners also had to bear the brunt of the arbitration, which cannot have been much less than £1,000.

The 143 requisitions, which were characteristic of the requirements for an old building, and might be read with particular care by the borough surveyor responsible for some of the old theatres in the provinces, are as follows, and they constitute one of the finest object lessons of the principles underlying the improvement of an old structure.

Their actual date is of March, 1904, and we believe the arbitrator's decision was dated in the autumn of 1905, the work being undertaken in 1906:—

(1) That the existing gallery staircases be reconstructed in accordance with the regulations made by the Council in July, 1901, and that two additional exit staircases, 4 ft. 6 in. wide, be provided from the upper portion of the gallery to the streets.

(2) That all doors in exit ways or staircases, including those to private boxes, be hung on the exit way, or staircase, side of the wall, be made to close with the stream of traffic going out, and be made self-closing.

(3) That the gallery and balcony tiers, including the floor of the gallery refreshment-room, be reconstructed in fire-resisting materials; that in the reconstruction, the seating and gangways be arranged in accordance with the regulations made by the Council in July, 1901; and that the stay-bars and wooden struts obstructing the seats in the gallery be removed, and that the steppings be improved to the satisfaction of the Council.

(4) That the doorway on the p. side of the balcony now closed be opened up.

(5) That the refreshment counters on the o.p. side of the gallery and the back of the balcony and pit be removed, or the positions altered so as to leave the corridors and exit ways clear.

(6) That the enclosure wall to gallery refreshment bar be carried up, or so protected as to prevent persons climbing on to it.

(7) That the "tell-tale" clock on the p. side of the gallery be removed to a position in which it does not obstruct the exit.

(8) That all wood-linings be removed from all parts of the theatre, and where wood construction is exposed by so doing, plaster on metal lathing be substituted.

(9) That the wooden louvres at the back of the gallery saloon be replaced by metal louvres.

(10) That the ceiling of the cupboard in the exit passage from the p. side of the gallery be put into proper repair.

(11) That all recesses and projections in exit ways be defended to the satisfaction of the Council.

(12) That the floors of the lobbies at the pit entrance and at the foot of the gallery staircases be put into proper repair.

(13) That all woodwork not necessary for the construction of the balcony extra exit staircase be removed.

(14) That the doorways leading from the balcony corridors on to the grand staircases be increased in width to 4 ft. 6 in. between the leaves of the door when open.

(15) That all fire buckets, grenades, gas-brackets, etc., be placed out of the headroom 6 ft. 9 ins. above the level of the floor.

(16) That the doorway at the end of the seating on the o.p. side of the first circle be increased in width to 4 ft. 6 ins. in the clear.

(17) That the seating of the first circle be re-arranged to comply with the regulation made by the Council in July, 1901, and that slopes be substituted for the two steps by the private boxes.

(18) That the seating of the grand circle be re-arranged in accordance with the regulations made by the Council in July, 1901.

(19) That the columns in the angles of the Royal retiring room be securely fixed.

(20) That the hat and coat pegs be removed from the stalls exits on the p. and o.p. sides, and the corridor at the back and sides of the stalls.

(21) That the refreshment bars at the end of the stalls, corridors on the p. and o.p. sides be separated by partitions of fire-resisting materials from the passages leading to the stalls exits adjoining the doors being made self-closing, and being hung to close with the stream of traffic.

(22) That the pictures on the walls of corridors and exit ways be securely fixed to the walls.

(23) That when the pass-doors between the pit and the stalls corridor are not being used as exits, the openings be filled in with partitions which do not resemble doors.

(24) That the opening to the carpenter's room be labelled "No exit."

(25 That the stalls seating be re-arranged in accordance with the regulations made by the Council in July, 1901.

(26) That the pit seating be re-arranged in accordance with the regulations made by the Council in July, 1901.

(27) That the spikes and iron pins be removed from the stay bars of the pit entrance barriers.

(28) That the passage to the ladies' lavatory, p. side, be cut off by a door hung flush with the face of wall and made to shut with the stream of traffic going out, and that a "No exit" be provided.

(29) That the single steps outside the doors of the rotunda and grand stairs be removed from the thresholds and placed next the outer steps, and that each flight of steps be provided with handrails on both sides.

(30) That the lock be removed from the bolt of the door to the rotunda.

(31) That the rooms at the north side of the vestibule used as store for seats, be cut off from the vestibule and pit, and entrance lobby, and from all other parts of the theatre, by fire-resisting partitions, ceilings and doors.

(32) That the statue of Sir Walter Scott be placed in a position where it will not obstruct the exit.

(33) That central handrails be provided to the flights of the grand staircases not now so fitted, and that the stair rods be replaced by others which do not cause inconvenience.

(34) That the doorways from the grand saloon to the grand staircases be increased in width to 3 ft. 6 ins., the doors to be hung to close with the stream of traffic, and to leave no recess, and that the bolts be removed from these doors.

(35) That the kitchen and store at the north side of the grand saloon be cut off by fire-resisting materials and door.

(36) That the box stairs on the prompt side be reconstructed in fire-resisting materials without winders.

(37) That a dual system of lighting be provided to the box stairs.

(38) That the decorations around the proscenium opening, including the columns and fronts of the private boxes, be rendered fire-resisting, that the hollow space be filled in with fireproof materials, and that the woodwork forming part of the old proscenium wall on the auditorium side be removed.

THE ROOF CONSTRUCTION AT DRURY LANE.

(Note: The gridiron had been altered since this view was taken.)

(39) That the unnecessary woodwork beneath the floor of the orchestra be removed.

(40) That the staircase from the grand circle to the stage level be reconstructed of fire-resisting material.

(41) That the use of the green room as a property room be discontinued, or that a passage enclosed by fire-resisting materials be formed on the p. side leading to the dressing-room.

(42) That gas be replaced by electric light throughout the theatre.

(43) That the windows of dressing-rooms at the level of the floor be properly protected by guard bars.

(44) That the lighting and ventilation of dressing-rooms Nos. 14, 15, inner and 15 outer p. side be improved to the satisfaction of the Council.

(45) That the lighting and ventilation of dressing-room No. 18 be improved, or that its use as a work room or dressing-room be discontinued.

(46) That the ceiling of the wardrobe room on the top floor of the dressing-room block on the p. side be repaired.

(47) That the rooms and passages in the basement under dressing-rooms on the p. side be put into proper repair, and the rooms be lighted and ventilated to the satisfaction of the Council, and that if used as workshops or stores, they be cut off from other parts of the theatre by fire-resisting materials and doors.

(48) That the use of the tunnel as a dressing-room be discontinued.

(49) That the openings between the tunnel and the spaces beneath the auditorium and the orchestra be fitted with fire-resisting doors.

(50) That the use of the rooms in the basement o.p. side be discontinued as dressing-rooms, or that they be properly separated from the stores. That the rooms be put into proper repair, and the lighting and ventilation improved to the satisfaction of the Council.

(51) That guard-rails be fixed round the well beneath the stage.

(52) That the floor of the passage in the basement beneath the dressing-rooms on the o.p. side of stage be put into proper repair.

(53) That the window sashes at the foot of the dressing-room staircase, o.p. side, and those on the ground floor level be fixed and formed of hardwood, and glazed with fire-resisting glass.

(54) That the partitions in the openings in the walls between the dressing-room and the flies on both sides be made satisfactorily fire-resisting.

(55) That the passage and the vaults under the pavement in Russell Street be cleansed, and the rubbish removed.

(56) That the opening between the passage at the back of the space under the stage and the space beneath the horse rake be bricked up, and the doorway fitted with a fire-resisting door, hung to close automatically.

(57) That the use of the cellar, directly under the back stage, as a property store, be discontinued, and that the doorway be fitted with an iron door to close automatically.

(58) That the floor of the passage at the back of the stage be made fire-resisting, and that the doors from the sloping way to Russell Street, be fitted with automatic fastenings as a means of exit from this part of the theatre.

(59) That all defective armoured doors be put into proper working order.

(60) That an exit be constructed from the ballet-room to Vinegar Yard.

(61) That alternative means of escape be provided from all dressing-rooms.

(62) That the window in bridge leading to old property workshop room be protected by fire-resisting glass and non-flammable paint.

(63) That the floor of the property making workshop be made fire-resisting.

(64) That the iron doors to goods lift be made to close automatically; that the window to the cupboard looking into the lift be bricked up, and that the lift be completely enclosed.

(65) That the room next the iron escape stairs from the dressing-rooms and workshops, o.p. side, be not used as a storeroom, and that a gate be placed at head of stairs leading down to room No. 23, hung so as to close with the stream of traffic.

(66) That the separation between attendants' dressing-room on the top floor, o.p. side, and the gallery lavatory be made satisfactory.

(67) That the wardrobe rooms on the top floor, o.p. side be cut off from the dressing-rooms below by a fire-resisting door.

(68) That the use of room No. 14 o.p. side, as a stock room be discontinued, or that it be separated from the dressing-rooms by fire-resisting materials.

(69) That the glazed panels of doors to stage entrance lobby be guarded, and that the locks be removed from these doors.

(70) That the scene store be properly ventilated to carry off smoke in case of fire, and be separated from the workshop above by means of a fire-resisting floor.

(71) That exhaust cowls be provided in the roof of paint room.

(72) That the gas battens and gas rings in the paint room be properly protected.

(73) That the opening betwen the electrical box and stage be fitted with a fire-resisting screen and releasing gear to the satisfaction of the Council.

(74) That the gear for lowering the fire-resisting screen and turning on the sprinklers be duplicated, so that they can be manipulated at or near the stage door, as well as from the stage, that some means be adopted to accelerate the descent of the fire-resisting screen, and that stop and drain cocks under seal be fitted to the supply to the sprinkler to allow of periodical inspection.

(75) That the portion of the stage floor between the fire-resisting screen and orchestra wall be made fire-resisting so as to complete the separation between the auditorium and the stage at this point.

(76) That the space between the fire-resisting screen and the proscenium wall be made good in fire resisting materials at the sides and head.

(77) That all scenery, wings, sky borders, cloths draperies, gauzecloths, floral decoration, properties, hangings, curtains, etc., whether on the stage, in the auditorium, or in other parts of the premises, be rendered and maintained non-inflammable.

(78) That the upper and lower flies and bridges be reconstructed in fire-resisting materials.

(79) That the wooden circular staircase from the upper to the lower flies on the p. side, and the wooden step ladder on the o.p. side be replaced by stairs of fire-resisting materials, and of satisfactory rise and tread.

(80) That the cross battens be fixed to the grid.

(81) That the skylights or dormer windows in the roof of front stage to the extent of 1-10th the area of the stage floor (about 350 sq. ft.), be made to open from the stage level by the cutting or burning of a cord, and be glazed with sheet glass not more than 1-12th inch in thickness, and that exhaust cowls be provided in the stage roof to the satisfaction of the Council.

(82) That the skylights in roof over back stage be glazed with sheet glass not more than 1-12th inch in thickness, and No. 4 divisions made to open from the stage floor.

(83) That two exhaust cowls be fitted to roof of back stage.

(84) That the gangway to, and the casement of the dormer window leading on to the roof, be put into proper repair.

(85) That the auditorium roof, including the wooden ceiling, be removed, and be reconstructed in fire-resisting materials, to the satisfaction of the Council.

(86) That the skylights in the roof over the auditorium be put into proper repair.

(87) That the openings in the upper part of the proscenium wall be bricked up, and if necessary, the space in the roof be approached from the space over the boxes, o.p. side.

(88) That the step ladders on the roof be put into proper repair.

(89) That the wooden division across Vinegar Yard be removed, or if it be necessary to retain this that the opening be fitted with doors to open automatically, and the yard leading to Drury Lane be kept clear of obstructions.

(90) That the wall separating the house-carpenter's shop from the mazzanine passage, p. side be made 14 inches thick.

(91) That all exit doors from the auditorium and the stage be provided with distinctive lights fitted over them, such lights to illuminate the exit notices, and be maintained throughout the performance.

(92) That all exit doors be provided with notices clearly painted on them, indicating the method of opening them.

(93) That broad, conspicuous lines at shoulder level, with frequent arrows indicating the way out, be painted on the walls in all the corridors and exits leading to the street.

(94) That an inscription of the following nature be exhibited on the fire-resisting screen—"Safety Curtain"—in sufficiently large letters that it can be read from all parts of the house.

(95) That a second fire-resisting screen and sprinkler be provided on the auditorium side of the proscenium wall, with duplicate releasing gear from the orchestra and stage entrance.

(96) That all doors leading from the seating or exit ways to other parts of the premises be made to correspond in colour and decoration with the walls in which they occur.

(97) That all soft woodwork beneath, on, or above the stage be removed, and steel and hardwood construction substituted

(98) That the bars of the automatic fastenings of the scenery doors on the o.p. side be placed at a convenient level, and a slope of fire-resisting material provided to make these doors available for exit from the stage.

(99) That a guard rail be provided to the front of the balcony tier to the satisfaction of the Council.

(100) That the Council's requirements with regard to "exit" and "no exit" notices, fire and stove guards, hand-rails, protection of skylights, gas meters, gas piping, and fittings, etc., be complied with.

(101) That the hemp ropes by which the back battens are suspended be replaced by wire ropes.

(102) That all holes in the proscenium wall in the divisional walls of the stage, and in the tunnels on the p. and o.p. sides be made good.

(103) That the windows in the scene store overlooking Russell Street, where broken, be reglazed, and that they be protected by wire guards.

(104) That the cone hydrants be abolished, and screw-down valves substituted.

(105) That the hydrants supplied from tanks be augmented by connecting them up to the water company's high pressure main.

(106) That all hydrants and hose be fitted with screws of the M.F.B. pattern, and that the former be fitted with bibcocks, so as to be available for filling buckets.

(107) That all fire-resisting doors be made self-closing and silent.

(108) That the small brick chamber erected on the roof of the portico in Catherine Street, and used in connection with the electric lighting arrangements, be enlarged.

(109) That the switches and connections for the outside signs, be removed from this chamber, and be taken as separate circuits off a separate board, which should either be inside the building, or, if possible, in a separate chamber.

(110) That the system of sub-division adopted for the service from the chamber on the roof of the portico in Catherine Street, for the supply of saloons and front of house generally (including staircases, corridors and exits), be improved.

(111) That the chamber for the Russell Street connection be repaired.

(112) That proper provision be made for the electric main entering the theatre from Vinegar Yard, as the room at present in use is much too small, is not properly ventilated, and is not kept separated from the gas-meter room.

(113) That the mains and apparatus be completely rearranged in accordance with the Council's regulations.

(114) That all dead cable be removed.

(115) That dividing pieces be fixed between the poles of the fuses.

(116) That if the theatre is to be provided with a double supply from a supply company or companies, separate chambers be used.

(117) That the sub-circuits for lamps, and par-

AN EAR Y EXAMPLE OF THE EFFICACY OF THE ASBESTOS CURTAIN: FIRE AT THE QUEEN'S THEATRE, MANCHESTER, IN AUGUST, 1890.

ticularly those for outside lamps, be in no case taken directly from the company's mains.

(118) That "B" and "C" circuits be put in independent of the stage board.

(119) That the fittings generally in the theatre be overhauled, and put into good condition or renewed, and that in the case of the gallery the fittings be fixed higher, or others of a different kind be used.

(120) That the insulation of the installation generally be improved.

(121) That the fuse-boards generally be overhauled or renewed.

(122) That the circuits of stage-board be re-arranged and that the stage board be rearranged and repaired generally.

(123) That all circuits carrying heavier currents than allowed by the regulations be re-arranged.

(124) That all battens and hanging lengths of bare strip pattern be altered, and that the leads to the battens be provided with protective covering.

(125) That the lighting under the stage be improved and re-arranged, and that the stage plugs be replaced by others of an improved type.

(126) That the liquid resistance gear be thoroughly overhauled, and the chamber ventilated to the open air.

(127) That the "effect board" be adequately guarded; that the resistances connected to it be properly fixed and covered, and that these resistances be put into a fire-proof resistance room.

(128) That the motor leads be adequately fused, and dividing spaces between poles provided for the larger fuses.

(129) That the motors be overhauled, that all "earths" be removed, and that the wiring in many places be made more permanent than at present.

(130) That the arc lamp resistances be covered and placed in a fire-proof chamber, and that the cables to the arc lamps in Russell Street be adequately covered, and the fuses for the same protected.

(131) That the arrangements for the electric lighting of the dressing-rooms be overhauled throughout, renewed when necessary, and made sufficient and permanent.

(132) That the wiring of the new "back addition" be completely renewed.

(133) That the signs in front of the building on the Catherine Stret portico be renewed.

(134) That the gas-lights in the dressing-rooms which at the present time are fixed under the electric lamps be removed, or that the position of the lamps be altered, and that the main and other fuse-boards for the dressing-room circuits be lined with fire-proof insulating material.

(135) That the electric installation work generally be brought into compliance with the Council's regulations, and be completed to the satisfaction of the Council.

(136) That the low-pressure steam boiler used for heating be provided with a locked-up safety-valve loaded to a pressure not exceeding 15lbs. per sq. in.

(137) That a certificate of a recent test made on the boiler by a recognised firm of engineers or by a boiler insurance company be forwarded for the information of the Council.

(138) That all radiators in connection with the heating apparatus, with the exception of those in the rotunda, be protected with strong wire guards.

(139) That an undertaking be given not to use any of the disconnected, and at present unused, parts of the heating apparatus without first informing the Council.

B.F.P.C. TESTS.

The tests undertaken during March by the British Fire Prevention Committee have been with dry powder fire extinguishers of the "Diamond" type, an exhaustive series having been recently undertaken. The official report will be issued this month. Another report also to be issued shortly is that on the "Accurate" fire extinguisher. We understand that among the minor appliances now being tested there will be an innovation—namely, textiles treated with a solution that renders them non-flammable. Constructive tests for the summer will include a reinforced concrete floor and a series of door tests. A considerable amount of work is also being undertaken by the Committee in the form of tabulating the results of a large number of tests, by which means a useful record will be furnished to architects who have to specify and select systems of construction for their clients.

AN EARLY EXAMPLE OF THE EFFICIENCY OF A FIRE CURTAIN.

Arising out of the Drury Lane Theatre fire, our attention has been called to the fire that occurred at the Queen's Theatre at Manchester in August, 1890, where an asbestos curtain also did its duty successfully. This curtain was erected as far back as 1887, and was constructed by the United Asbestos Co., Ltd. It consisted of asbestos cloth on an iron frame. In this case the fire was on the auditorium side, and the curtain protected the stage. The fire was a particularly fierce one, the auditorium being filled with inflammable material, and mainly of timber construction supported on cast-iron columns.

FIRE AT THE THEATRE ROYAL, WINDSOR.—In connection with the photographs and particulars of this fire which were published in our last "Fire-Resisting Construction Section," in our issue for March 11th, we are asked to state that the asbestos curtain which so effectively shut off the flames from the body of the auditorium was made by Messrs. Vaughan and Cook, Ltd., of 298 and 300, Goswell Road, London, E.C.

THEATRE REGULATIONS GENERALLY AND THOSE OF THE LONDON COUNTY COUNCIL.

It has been pointed out elsewhere that although London is well advanced in its arrangements for controlling the safety of theatres and places of public entertainment, the same cannot be said of the provinces—with but few exceptions, such as the cities of Liverpool, Glasgow, etc.

The rules of the London County Council are in many ways model rules, and no doubt the architect works to them to a certain extent, even without compulsion; but whenever some difficulty arises where the exigencies of the design do not fully agree with the London County Council's requirements, and there is no compulsion, it is very obvious that the rule is forgotten, and both architects and theatre managers are inclined to think more of convenience and cost than of an unenforceable regulation.

The regulations of the London County Council have been framed and amended from time to time—about four times we believe since the Council's existence, and prior to their advent the old Metropolitan Board also had a code of rules.

The rules now in force are those of July 30th, 1901, as amended November 30th, 1906, and further supplemented by certain lighting and heating rules of the Council dated March 25th, 1902, and also November 13th, 1906.

Regarding the lighting and heating rules, we do not desire to deal with them at this moment, particularly as one may take it generally that the best of the insurance companies' rules may be regarded as applying, and that there is no great difference between the Council's and those that might be termed the best practical rules.

But regarding the general requirements of the London County Council, we think it well to present them in full, having special regard to the fact that they may be of use to many of our readers in the provinces, particularly to those who act for the local authorities having the control of theatres.

1.—Generally.

Every person who shall be desirous of obtaining authority to open any such premises within the said County shall first make public his intention to erect such premises by exhibiting a notice-board on the proposed site in such a position that it can be plainly seen from the public way, or by advertisement in three newspapers circulating generally throughout the County or throughout the locality in which it is proposed to erect such premises, and shall then make an application in writing to the Clerk of the Council for a certificate under the Metropolis Management and Building Acts Amendment Act, 1878. For the purposes of the advertisement, differently dated issues of one paper shall count as different papers. The notice-board shall be maintained until the application has been dealt with by the Council. No application will be considered before the expiration of one fortnight after the receipt by the Clerk of the Council of a copy of the notice exhibited on the site or of each of the newspapers containing the advertisement.

The application shall contain a statement as to the nature and extent of the interest of such person in such premises, and the character of the entertainment for which such premises are proposed to be used. The application shall be accompanied by complete plans, elevations and sections in duplicate, drawn on the dull side of tracing linen, to a scale of ⅛th of an inch to a foot; and by a block plan on a separate sheet showing the position of such premises in relation to any adjacent premises, and to the public thoroughfares upon which the site of such premises abuts, drawn to a scale of not less than 1-20th of an inch to a foot.

A plan and section of the drains proposed to be laid from such premises shall be submitted at the same time, and such plan shall indicate the sewer or sewers to which the drains are to be connected, and the section shall show the surface level of the street, the level of the lowest portion of the premises which is to be drained, and the level of the sewer or sewers. All levels shall be given in relation to ordnance datum.

All drawings shall be coloured to distinguish the materials employed in the construction of the building.

The width of all staircases, and the number of stairs in each, the width of corridors, gangways, and doorways, together with the heights of the tiers, and other parts of such premises shall be indicated on such drawings.

The thickness of the walls, and scantlings of the various materials shall be clearly shown on such drawings by figured dimensions.

The cardinal points shall be marked upon each plan.

The plans shall show the respective numbers of persons to be accommodated in the various parts of such premises, and the area to be assigned to each person, and shall be accompanied by a specification of the works to be executed, describing such of the materials to be employed and the mode of construction to be adopted, as may be necessary to enable the Council to judge whether the requirements of these regulations will, when such premises have been completed, be complied with.

In the case of schools and halls used for parochial or mission purposes and having a superficial area for the accommodation of the public of not more than 1,000 square feet, elaborate drawings will not be required, but sufficient detail shall be given to indicate the part of the premises to be used for public entertainments and the surroundings.

One copy of such drawings and specifications will be returned to the applicant, if it is so desired, but the other copy shall remain the property of the Council.

2.—Site.

One-half at least of the total length of the boundaries of the site of any such premises which consist of an entire building, and in case of a room or other such premises not consisting of an entire building, one-half at least of the toal length of the boundaries of the site of the building of which such room or other such premises form part, shall abut upon or front to public thoroughfares, of which one thoroughfare at least shall not be less than 40 ft. wide and of the remainder none shall be less than 30 ft. wide if a carriage-way, or 20 ft. wide if a footway. These widths shall continue for the whole length of the roads between the nearest thoroughfares in each direction connecting therewith. The frontage of the site to a thoroughfare not less than 40 ft. wide shall not be less than one-sixth of the total length of the boundaries of the site.

If, in order to comply with No. 10 of these regulations, an additional passage or way should be necessary, it may be provided by means of a private passage or way.

Such passage or way shall not be less than 10 ft. wide, and shall be under the complete control of the owner of such premises, and, if less than 20 ft. wide, no doors or other openings of the adjoining premises shall communicate therewith or overlook any portion of such passage or way.

3.—No Theatre, etc., Under or Over any Building.

No such premises, in which a stage will be erected and in which scenery will be used, shall be constructed underneath, or on the top of, any part of any other building, nor shall such premises contain living rooms.

4.—Walls (Openings in and Windows Overlooking).

No openings shall be allowed in the walls or roof of such premises within 20 ft. of any adjoining property unless a brick wall of the thickness prescribed by the Building Act be erected between such premises and the adjoining property to such a height that no part of any opening either in such premises or in any building which may be erected on such adjoining property shall be higher than the part of the wall immediately opposite to it. A similar wall shall be erected between any openings in such premises and any inflammable structure, erection, or material on any adjoining property.

Construction.

5.—Walls (External), etc.

All such premises shall be enclosed with proper external or party walls of brick or stone.

The thickness of all external party or cross walls shall not be less than the thickness prescribed by the London Building Act, 1894 (clause 12 of Part II. of the 1st Schedule to such Act excepted) for walls of similar height and length in buildings of the warehouse class, or such greater thickness as shall be required by the District Surveyor, or the Tribunal of Appeal, under section 78 of the London Building Act, 1894.

Where such premises are part of another building they shall be cut off from such other building by party walls and party structures of fire-resisting materials in a manner to be approved by the Council, and no part of such premises shall overlook any portion of the adjoining part which may be liable to communicate fire to such premises.

6.—Floors, Tiers, and Roof.

In all such premises the floors, tiers and roof of the auditorium, and all parts used by the public, shall be constructed of fire-resisting materials to the satisfaction of the Council, and the flooring, if of wood and not laid on solid foundations, shall be laid with iron tongues.

Front of House.

7.—Tiers (Number of).

No such premises shall have more than three tiers or horizontal divisions, including the gallery, above the level of the pit.

Where the front seats of any tier are separated from the other seats by a partition, such seats shall not count for the purpose of this regulation as a separate tier.

8.—Tiers (Height of).

Where the first tier or balcony of such premises extends over the pit, stalls, or area, the height between the floor of the pit and the first tier shall not be at any part less than 10 ft.; the height between the floor of the highest part of the gallery and the lowest part of the ceiling over the same shall not be less than 12 ft. The height between the tiers shall in no case be less than 8 ft.

9.—Pit (Floor of).

In all such premises the floor of the highest part of the pit, or of the stalls, where there is not pit, shall not be more than six inches above the level of the street at the principal entrance to the pit, and the lowest part of the floor of the pit or stalls shall not be lower than the level at which it can be effectually drained by gravitation into a public sewer, nor more than 15 ft. below the level of the street at the principal entrance to the pit.

In any case the lowest floor shall not be placed at such a level as will render it liable to flooding, and such premises shall be efficiently and properly drained to the satisfaction of the Council.

10.—Entrances and Exits.

In all such premises two separate exits shall be provided from every tier or floor which accommodates not more than 500 persons, and where a tier or floor accommodates more than 500 persons, an additional exit shall be provided for every 250 or part of 250 persons above 500. Each of such exits shall be not less than 5 ft. wide between the walls at any point or between the leaves of the doors when open. Two of the exits from each tier or floor shall deliver into different thoroughfares or ways.

In the case of a tier or floor not accommodating more than 300 persons two 4 ft. exits will be required.

If any tier or floor shall be divided into two or more parts, exits as set out above shall be provided from each of such parts.

In calculating the number of persons which can be accommodated in any tier or part of a tier of such premises, the standing space from which a view of the performance can be obtained (with the exception of that afforded by the intersecting gangways) will be considered as well as the seated area.

Exits shall be arranged so as to afford a ready means of egress from all parts of each tier or floor, and shall lead directly into a thoroughfare or way.

It shall be compulsory on the management of such premises to allow the public to leave by all exit doors.

11.—Corridors, Passages, etc.

Every lobby, corridor, or passage in such premises intended for the use of the audience shall be formed of fire-resisting materails, and shall be at the narrowest point when finished of the widths specified in No. 10 of the regulations for exits.

Where possible, inclines shall be used instead of steps, but no corridor, passage or gangway shall be inclined to a steeper gradient than 1 in 10.

There shall be no recesses or projections in the walls of such corridors or passages within 5 ft. of the floor.

12.—Vestibules.

Where vestibules are provided in such premises not more than three tiers or floors or (where such tiers or floors are divided into two or more parts) not more than three of such parts of tiers or floors shall communicate with one vestibule.

The aggregate width of all the doorways or passages that lead from a vestibule towards a thoroughfare or way shall be at least one-third greater than the aggregate width of all the exits required by the regulations that lead to such vestibule.

13.—Cloak Rooms.

The corridors in such premises shall not be used as cloak rooms, and no pegs for hanging hats and cloaks shall be allowed therein.

Where cloak rooms are provided, they shall be so situated that the persons using them shall not interfere with the free use of any exit way.

14.—Staircases.

All staircases in such premises intended for the use of the audience from any tier or part of a tier accommodating not more than 300 persons shall be at least 4 ft. wide at their narrowest parts, and those intended for the use of the audience from any tier or part of a tier accommodating more than 300 persons shall be at least 5 ft. wide at their narrowest parts.

All such staircases shall have solid square (as distinguished from spandril) steps and landings of York or other approved stone, or of such other fire-resisting material and construction as the Council may in any special case approve, with treads not less than 11 ins. wide and with risers not more than 6 ins high (each lapping at least 1 inch over the back edge of the step below it), without winders, in flights of not more than 15 or less than 3 steps each.

The treads and risers of each flight of steps shall be of uniform width and height, and the steps shall be pinned into brick walls at both ends.

The several flights of such steps shall be properly supported and enclosed to the satisfaction of the Council.

No staircase shall have more than 2 flights of 15 steps without a turn, the depth of the landing between such flights being at least the same as the width of the staircase.

All landings shall be 6 ins. thick.

Every staircase shall have a roof of fire-resisting materials to be approved by the Council.

A continuous and uninterrupted handrail shall be fixed on both sides of all steps and landings,

supported by strong metal brackets built into the wall, but such handrails shall not project more than 3 ins.

Where the flight of steps re-turn, the newel wall shall be chased so as to allow the handrail to turn without projecting over the landing.

There shall be no recesses or projections in the walls of such staircase within 5 ft. of the floor, and any gas or electric light fittings shall be at least 6 ft. 8 ins. above the steps or landings.

15.—Doors and Fastenings.

All doors in such premises used by the public as exit doors shall, except where otherwise approved, be hung in two folds and be made to open outwards towards the thoroughfare or way.

All internal doors shall be hung so as not to obstruct, when open, any gangway, passage, staircase, or landing.

No door shall open immediately upon a flight of steps, but a square landing at least 3 ft. in width shall be provided between such steps and such doorway.

All exit doors, having fastenings, shall be fastened by automatic bolts only, of a pattern and in a position to be approved by the Council; but where such doors are also to be used by the public for entrances they may be fitted with lever or other approved fastenings in approved positions. Doors so fitted, however, must not be fastened during the presence of the public.

All doors and all gates used for entrances, shall be made to open both ways, and shall, when opened inwards, be so fitted that they can be locked back against the wall in such a manner as to require a key to release them.

All doors leading from exit passages, staircases or corridors to the other parts of the building shall be hung so as to be closed by the stream of persons passing from the auditorium to the street, and be fitted with springs. No door handles or other fittings shall project into exit ways more than 1 inch when the doors are open.

All barriers and internal exit doors shall be made to swing or to open outwards, with no other fastenings than automatic bolts

No locks, monkey-tail, flush or barrel bolts, or locking bars, or other obstructions to exit, other than as before mentioned, shall be fitted on any doors, gates or barriers.

16.—Exit, etc., Notices.

All exit and other doors or openings in such premises used by the public for the purposes of exit shall be indicated by notices clearly painted to the satisfaction of the Council in 7-inch letters.

Such notices shall where possible be painted over such doors or openings at a height of at least 6 feet 9 inches above the floor.

The words "no exit" shall be clearly painted to the satisfastion of the Council in 7-inch letters at least 6 feet 9 inches above the floor, over all doors or openings which are in sight of the audience, but which do not lead to exists.

17.—Gangways.

Passages or gangways not less than 3 feet 6 inches wide shall be formed leading direct to the exit doors, and gangways 3 feet 6 inches wide shall be provided intersecting the rows of seating in such a manner that no seat shall be more than 10 feet from a gangway measured in the line of the seating.

18.—Enclosures.

No enclosure shall be allowed in any such premises where the public can assemble for any other purpose than to view the performance, except so far as the Council shall consider necessary for the provision of refreshment bars, or in the case of a theatre for the provision of a foyer.

19.—Seating.

The seating area assigned to each person shall not be less than 2 feet deep and 1 foot 6 inches wide in all parts of the house where no backs or arms are provided to the seats, and not less than 2 feet 4 inches deep by 1 foot 8 inches wide where backs or arms are provided. In all cases, however there shall be a space of at least 1 foot in depth between the front of one seat and the back of the next measured between perpendiculars.

20.—Chairs.

Where chairs are used in such premises, they shall be battened together at a distance of not less than 1 ft. 8 ins. from centre to centre where they have arms, and 1 ft. 6 ins. where they are without arms, and in lengths of not less than four or more than 12 in a section.

Back of House

21.—Proscenium (Wall).

In all such premises where a stage with a proscenium will be erected, such stage shall be separated from the auditorium by a brick proscenium wall not less than 13 ins. in thickness, and such wall shall be carried up the full thickness to a height of at least 3 ft. above the roof, such height being measured at right angles to the slope of the roof, and shall be carried down below the stage to a solid foundation.

Not more than three openings shall be formed in the proscenium wall, exclusive of the proscenium opening.

No such opening shall exceed 20 square feet in area. Each of such openings shall be closed with a wrought iron door not less than ¼th of an inch thick in the panel, hung in a wrought iron frame, so as to close of itself without a spring, and with a 3-in. lap or with such other fire-resisting door and frame as may be approved by the Council.

No openings formed in the proscenium wall shall, at the lowest part, be at a higher level than 3 ft. above the floor of the stage.

All the decorations around the proscenium opening shall be constructed of fire-resisting materials.

A separate exit shall be provided from the stage direct to a thoroughfare or way.

Wherever possible electric light shall be the only illuminant used for the stage.

22.—Proscenium (Screen).

The proscenium opening shall be provided with a fire-resisting screen to be used as a drop curtain, of such pattern, construction and gearing, and with such arrangements for pouring water upon the surface of the screen which is towards the stage, as may be approved by the Council.

23.—Stage (Roof Over).

The space above the stage shall be of sufficient height to allow of all scenes and of the fire-resisting screen being raised above the top of the proscenium opening in one piece and without rolling.

The roof over the stage shall not be of fire-resisting material or heavy construction, and shall be provided with an opening at the back thereof equal at the base to 1-10th the area of the stage. Such opening shall be glazed at the top and sides with sheet glass not more than 1-2th of an inch in thickness, and be capable of being opened by the action of lowering the fire-resisting screen or by the cutting or burning of a cord, to an extent equal at least to the superficial area required at the base of the opening. Suitable exhaust cowls shall also be provided on the stage roof.

24.—Flies, etc.

The floors of the flies of such premises shall be constructed of fire-resisting materials to the satisfaction of the Council.

Adequate means of escape shall be provided from the flies and the gridiron to the satisfaction of the Council.

25.—Dressing-rooms.

Dressing-rooms shall be arranged in a separate block of buildings, or divided from such premises by party walls, with only such means of communication therewith as may be approved by the Council.

All dressing-rooms and staircases leading thereto shall be constructed of fire-resisting materials, and shall be connected with an independent exit leading directly into a thoroughfare or way.

All dressing-rooms shall be adequately ventilated to the outer air by windows in the external walls.

No decoration, or construction for the purpose of decoration, shall be employed in such dressing-rooms which does not adhere without any cavities to the surface of the wall.

No dressing-rooms shall be situated more than one storey below the street level.

The exit doors from the dressing-room block shall be fitted with automatic bolts only.

Sufficient and separate water-closet accommodation shall be provided for the use of the male and female artistes and orchestra, and urinal accommodation for the use of males. Such water-closets shall be constructed and arranged to the satisfaction of the local sanitary authority.

26.—Workshops, etc.

All workshops, store-rooms, wardrobe or painting rooms, in connection with such premises, shall be separated from such premises and from each other by brick walls not less than 9 ins. thick, and shall be placed in positions to be approved by the Council.

All openings in such walls shall be closed by fire-resisting doors as described in No. 21 of these regulations. Such doors may, however, be of such greater size as the Council may approve.

All such doors, if consisting of a single fold, shall be made to overlap the door frame at least 3 ins. when closed; and, if made in two folds, such folds shall overlap each other, when closed, at least 3 ins.

All floors and ceilings of such rooms shall be formed of fire-resisting materials.

All such rooms shall be ventilated by windows in the outer walls or otherwise to the satisfaction of the Council.

Sufficient and separate water-closet accommodation shall be provided for the use of the male and female workpeople, and urinal accommodation for the use of the male workpeople. Such water-closets shall be constructed and arranged to the satisfaction o fthe local sanitary authority.

27.—Limelight Tanks, Boilers, and Dynamos.

All limelight tanks, boilers with engines, and dynamos with engines in connection with such premises, shall be placed in ventilated chambers or buildings of fire-proof construction.

Such chambers or buildings shall be separated from such premises, and from each other, by brick walls and fire-proof floors, and shall be enclosed upon one or more sides by external walls.

All openings between such premises and such chambers or buildings shall be fitted with fire-resisting doors as described in No. 21 of these regulations; such doors, however, may be of such greater size as the Council may approve.

28.—Scene Store, etc.

All scene stores and property rooms in connection with such premises shall be enclosed by brick walls not less than 9 ins. thick, and shall have floors and ceilings of fire-resisting materials.

All openings from such scene stores and property rooms to such premises shall be closed by fire-resisting doors as described in No. 21 of these regulations; such doors may, however, be of such greater size as the Council may approve.

29.—Ironwork.

All constructional ironwork in such premises shall, if considered necessary, be embedded in fire-resisting materials in a manner to be approved by the Council.

30.—Inflammable Linings, etc.

No soft wood or other inflammable wall linings, partitions, screens, or barriers shall be used in any part of such premises, and no cavities shall be left behind any linings. All woodwork of the stage shall be rendered non-inflammable or be hard wood.

31.—Skylights, etc

All skylights, and lantern lights in such premises which may be liable to be broken, shall be protected by stout galvanised iron-wire guards, securely fixed on the outside of such skylights or lantern lights.

Lighting.

32.—Gas.

All such premises when lighted by gas shall have separate and distinct gas services and meters as follows :—

(a) To the stage (wherever possible electric light shall be used);
(b) To the auditorium.
(c) To the staircases, corridors, and exits.

Such meters shall be placed in properly ventilated chambers of fireproof construction, the openings to which shall be fitted with fire-resisting doors as described in No. 21 of these regulations.

All gas brackets shall be fixed without joints; and all burners within reach of the audience shall be fitted with secret taps, and shall be efficiently protected by glass or wire globes.

All gas burners within 3 ft. of inflammable ceilings shall be fitted with consumers of uninflammable material to distribute the heat.

All gas pipes shall be made of iron or brass.

Where there is to be a stage or where scenery is to be used, the footlights or floats shall be protected by fixed wire guards.

The rows and lines, and gas burners in the wings (which must commence 4 ft. at least from the level of the stage) shall be protected by fixed iron-wire guards.

All battens shall be hung by at least three wire ropes, and shall be protected at the back by a solid metal guard and wire fixed to a stiff iron frame at such a distance from the gas jets that no part of the scenery or decoration can become heated.

All movable lights shall be fitted with flexible tubes, and the gas in every case shall be capable of being turned off by the tap on the stage as well as by that on the flexible tube.

All flexible tubes shall be of sufficient strength to resist pressure from without.

An indicating gas plate shall be provided at a convenient place at the side of the stage. A stop cock shall be provided outside such premises in order that the supply of gas may be cut off when necessary.

33.—Additional Means of Lighting.

Additional means of lighting in such premises for use in the event of the gas or the electric light being extinguished, shall be provided for the auditorium, corridors, passages, exits, and staircases, by a sufficient number of oil or candle lamps, of a pattern to be approved by the Council properly secured to an uninflammable base and placed, if possible, out of reach of the public. This shall not apply where there is (a) a complete installation of both gas and electric light, or (b) two complete systems of electric lighting from separate companies, or (c) two complete systems from one company if specially approved by the Council for the purposes of these regulations. In cases (b) and (c), however, the exit notices shall be provided with independent means of lighting or with lights on both systems.

All lamps (or lights) on both systems in the staircases, corridors, passages and exits (including the exit notices) shall be kept alight during the whole time the public are in such premises.

No mineral oils shall be used in oil lamps.

34.—Sun Burner.

If there be a sun burner in such premises it shall be provided with a pilot light, which shall be placed so that such sun burner can be lighted from the stage.

Fittings and Equipment.

35.—Ventilation

All parts of such premises shall be properly and sufficiently ventilated in a manner to be approved by the Council.

All openings for ventilation shall be shown on the plans, and described in the specification, which shall be submitted to the Council for its approval.

36.—Water-closets, etc.

Each part of all such premises used by the public shall be provided with sufficient and separate water-closet accommodation for the use of males and females, and urinal accommodation for the use of males. Such water-closets and urinals shall be constructed and arranged to the satisfaction of the local sanitary authority.

37.—Hydrants, etc.

All such premises shall be provided with a sufficient number of hydrants each of a diameter of not less than 2½ inches; such hydrants shall be connected by, at least, a 3-inch main with a water company's high pressure street main.

Where such premises contain a large superficial area for the accommodation of the public, the size of the main supplying the hydrants shall be determined by the Council. A pressure of at least 30 lbs. on the square inch shall be maintained in the flies and upper tiers of such premises.

Each of such hydrants shall be provided with, at least, a 30-ft. length of hose with fittings of the London Fire Brigade pattern, and shall be fitted with bibcocks for filling buckets. Three buckets filled with water shall be kept near each hydrant. Hand pumps or other small fire appliances shall be provided as required.

Where there is no constant supply of water, there shall be provided on the top of the proscenium wall, or at some other place to be

approved by the Council, two cisterns to be kept always filled with water.

Such cisterns shall be each capable of containing at least 250 gallons of water for every 100 persons of the audience to be accommodated in the building, and shall be properly protected from all danger from frost.

Fire mains shall be connected with such cisterns to hydrants to be fixed in such places and in such a manner as may be approved by the Council.

38.—TELEPHONE.

Every theatre, and, where considered necessary by the Council, all other premises licensed for public entertainments shall be connected with the nearest fire brigade by telephone alarm. The positions for such alarms and the number of points in the house shall be decided upon by the chief officer of the fire brigade. The installation and maintenance shall be carried out by the General Post Office at the cost of the lessee.

39.—HANGINGS, ETC

All woodwork of stage, hangings, curtains and draperies in such premises shall be rendered non-inflammable.

40.—FIRE (PRECAUTIONS AGAINST).

Blankets or rugs, and buckets filled with water shall always be kept on the stage, in the flies, scene-stores, or wings, and in the immediate passages approaching the dressing rooms of such premises, and attention shall be directed to them by placards legibly printed or painted and fixed immediately above them to the satisfaction of the Council.

Some person shall be held responsible by the management for keeping the blanket or rugs, and fire appliances ready for immediate use.

Hatchets, hooks, and other appliances, for taking down hanging scenery in case of fire, shall be always kept in readiness for immediate use.

The regulations as to fire shall be posted in some conspicuous place approved by the Council in such premises, so that all persons connected with such premises may be acquainted with such regulations.

41.—FIRE-PLACES.

No fire-place shall be formed in any portion of the auditorium or stage of such premises, and no system of heating which involves the use of naked light will be permitted within the stage risk.

All open fire-places or stoves in any part of such premises shall be protected by strong fixed iron-wire guards and fenders of not more than 1½-inch mesh completely enclosing the whole. A part of the guard or fender may be made to open for all necessary purposes.

42.—ELECTRIC LIGHTING AND HEATING.

The electric lighting and heating apparatus shall be carried out to the satisfaction of the Council, and no work shall be commenced until the sanction of the Council has been obtained to what is proposed to be done. Copies of the Council's regulations on the subject can be obtained on application to the Clerk of the Council.

43.—LIGHTNING CONDUCTOR.

Such premises shall, where considered necessary by the Council, be provided with a lightning conductor, to the satisfaction of the Council.

General.

44.—POWER TO MODIFY OR DISPENSE WITH THESE REGULATIONS.

The Council reserves to itself the right from time to time, in any special case to modify or dispense with these regulations.

All applications for dispensation or modification of these regulations shall be made in writing, addressed to the Clerk of the Council, and shall contain a statement of the facts of the particular case, and the reasons why it is desired to modify or dispense with, these regulations as applicable.

45.—PERSON RESPONSIBLE.

When the premises have been licensed, the person or persons in whose name the licence is granted by the Lord Chamberlain or the London County Council shall be held responsible for the due management of such premises, and for the safety of the public and his or their employees in the event of fire.

46.—ADDITIONS OR ALTERATIONS TO PREMISES.

No subsequent alterations shall be made to such premises without the sanction of the Council having been first obtained.

Notice of any intended structural addition to, or alteration of, any such premises shall be given in writing to the Clerk of the Council, and shall be accompanied by drawings, elevations and sections, block plan, and specification of the works to be executed similar to those required in the case of premises to be certified for the first time by the Council, and shall show such intended addition or alteration.

The Council will, if necessary, cause a fresh survey of such premises to be made.

No doors, bolts or other fastenings, obstructions to the means of egress, flap seats or other means of diminishing or stopping up the gangways, whether permanently or temporarily, shall be permitted.

New Company.

NORMANDY AND BRITTANY GRANITE CO., LTD.,—To acquire and work quarries of building-stone in any part of the world, and in particular granite quarries in Normandy and Brittany, and to carry on the business of quarriers for and workers and dressers of granite, building and granitic stone, etc. Registered Office: 3, East India Avenue, London, E.C. Capital: £40,000.

New London Buildings.

The following applications came before the London County Council at their meeting yesterday:—

Projecting wooden porches and wooden cornices to the eaves of fourteen houses on the western side of Leabourne Road, Stamford Hill, on the application of W. M. Dabbs and Son (*consent*).

Projecting one-storey shop in front of No. 162, Uxbridge Road, Hammersmith, on the application of W. C. Jordan, on behalf of J. Guy (*consent*).

One-storey shop in front of 59, Perry Hill, Catford, on the application of J. W. Falkner and Sons (*consent*).

Erection of a porch in front of No. 8, Montague Avenue, Brockley, on the application of A. Roberts, on behalf of H. Rigby (*consent*).

Addition to 36, Abbey Road, St. John's Wood, on the application of Pemberton and Clark, on behalf of Dr. E. C. Montgomery-Smith (*consent*).

Projecting balconies in front of the superstructure of the Great Northern, Piccadilly and Brompton Railway Co.'s Hyde Park Corner station, Knightsbridge, on the application of Delissa Joseph, on behalf of F. J. Coxhead (*consent*).

Two-storey wooden bay-windows oriel windows and porches to eight houses on the western side of Thrale Road, Streatham, on the application of Antill and Squires (*consent*).

One-storey addition at the rear of 226, Mitcham Road, Tooting, on the application of R. A. Swingler, on behalf of C. Blyton and Sons (*consent*).

Shop front at No. 120, Cheapside, City, on the application of E. Pollard and Co., on behalf of the Crown Emporium Co. (*refusal*).

Erection of buildings abutting upon Upper Richmond Road, Daylesford Avenue, Dungarvan Avenue, Roehampton Lane, and Langside Avenue, Wandsworth, on the application of E. J. Partridge, on behalf of H. J. Hawkins (*refusal*).

Conservatory and studio at the rear of No. 225, Burrage Road, Woolwich, on the application of E. H. Wright, on behalf of H. W. Kier (*consent*).

Iron and glass porch in front of No. 66, Harley Street, St. Marylebone, on the application of H. Blackadder, on behalf of Dr. T. D. Savill (*consent*).

External steel and concrete gangways and staircases at the rear of Nos. 14 and 15, Marlborough Mews, Oxford Street, abutting upon Aberdeen Mews, on the application of Bywater and Sons, Ltd., on behalf of Mr. Wolfe (*consent*).

Erection of a shed at No. 35, Henderson Road, Wandsworth Common, on the application of W. Johnson and Co., Ltd. (*refusal*).

Block of dwelling-houses, intended to be inhabited by persons of the working class, on the site of Nos. 32, 34, 36, 38 and 40, Holland Street, Southwark, so far as relates to the erection of a bath-room addition at the rear, on the application of F. W. Troup, on behalf of Miss E. L. Curteis (*consent*.)

Addition at the Borough Polytechnic Institute, to consist of an examination hall, classrooms and caretaker's rooms, on the application of R. Plumbe (*consent*).

Uniting of Nos. 17 to 21, Dering Street, and Nos. 315 and 317, Oxford Street, St. George, Hanover Square, on the application of Withers and Meredith, on behalf of O. Owen (*consent*).

Bankruptcies.

During the week ended April 3rd sixteen failures in the building and timber trades of England and Wales were gazetted.

C. Beach, builder, Hounslow. R.O., Feb 21.

J. J. BALL, builder, Plymouth. Adj. March 24.

A. B. BAKER, builder, Chiswick. Adj. March 21.

M. LANGLER, builder, Ipplepen. R.O., March 27. Adj. same.

P. KITCHENER, builder and contractor, Jarvis Brook. Adj. March 21.

T. H. STILES, builder, Southampton. Gross liabilities, £3,389; assets, £539; deficiency, £905.

G. H. CROOK, builder and contractor, Chorlton-on-Medlock and Manchester. R.O., March 24.

T. WALKER, joiner and builder, Armley, Leeds. Liabilities, £1,879; assets, £961; deficiency, £918.

G. TYSON, late builder, Bubwith, near Selby. First meeting, O.R.'s, Hull, April 4, at 11. P.E., C.C., Hull, April 27, at 2.

W. S. TIPPETT, builder, Newquay. First meeting, O.R.'s, Truro, April 7, at 12. P.E., Town Hall, Truro, April 18 at 11.45.

T. I. EVANS, builder, Cardiff. First meeting, O.R.'s, Merthyr Tydfil, April 6, at 2.30. P.E., C.C., Merthyr Tydfil, May 1, at 10.30.

R. POINTER, builder, Reading. First meeting, Queen's Hotel, Reading, April 9, at 12. P.E., Assize Courts, Reading, April 9 at 2.

E. COWLEY, builder and contractor. R.O., March 25. First meeting, O.R.'s, Swindon, April 18, at 10. P.E., C.C., Swindon, May 27, at 2.30.

H. WATSON, builder and contractor, Peterborough, Kingston-on-Thames, and Maidstone. Liabilities, £7,175; £3,623 secured; assets, £493.

E. READ, builder and contractor, Sawbridgeworth. First meeting 14, Bedford Row, London, April 6, at 12. P.E., Shirehall, Hereford, April 8, at 12.

A. ELLIS, builder, Middlesbrough, late Darlington. First meeting O.R.'s, Middlesbrough, April 7, at 11.30. P.E., C.C., Middlesbrough, April 10, at 10.30.

A. E. FLOWER, builder, London, W. R.O., March 24. First meeting, Bankruptcy Court, April 7, at 11. P.E., Bankruptcy Court, April 30, at 11.

H. P. PEARSON, builder, Lowestoft. R.O., March 24. First meeting, O.R.'s, Norwich, April 8, at 12.30. P.E., Town Hall, Great Yarmouth, April 14, at 11.

R. E. NARRACOTT, builder and contractor, Stoke Gabriel. R.O., March 27. First meeting, Gerston Hotel, Paynton. April 8, at 3. P.E., Town Hall, East Stonehouse, April 28, at 12.

E. MARTIN AND SON, builders and contractors, Oxted and Westerham. R.O., March 24. First meeting, Bankruptcy Court, London, April 4, at 11. P.E., C.C., Croydon, April 28, at 11.

Coming Events.

Wednesday, April 8.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Associates' Business Meeting, at 8 p.m.

GLASGOW INSTITUTE OF ARCHITECTS.—Mr. George L. Allen, M.I.M.E., on "Roof Coverings."

INSTITUTION OF MECHANICAL ENGINEERS.—Anniversary Dinner.

SOCIETY OF ARTS.—Sir William Preece on "Technical Education in America," at 8 p.m.

ARCHITECTURAL ASSOCIATION (Discussion Section).—Mr. Thomas H. Mawson on "Garden Architecture," at 7.30 p.m.

Thursday, April 9.

INSTITUTION OF CIVIL ENGINEERS.—Students' Visit to the works of Messrs. Fraser and Chalmers, and of Messrs. Vickers, Sons and Maxim, Ltd., Erith.

ARCHITECTURAL ASSOCIATION. — Annual Dinner, Gaiety Restaurant, at 7.30 p.m.

SHEFFIELD SOCIETY OF ARCHITECTS AND SURVEYORS.—Annual General Meeting

INSTITUTION OF ELECTRICAL ENGINEERS.—Mr. H. W. Handcock and Mr. A. H. Dykes on "Electric Supply Prospects and Charges as Affected by Metallic Filament Lamps and Electric Heating," at 8 p.m.

Saturday, April 11.

INSTITUTE OF SANITARY ENGINEERS.—Visit to East London District Waterworks, Lea Bridge.

NORTH OF ENGLAND INSTITUTE OF MINING AND MECHANICAL ENGINEERS.—Meeting at Newcastle, at 2 p.m.

Monday, April 13.

LIVERPOOL ARCHITECTURAL SOCIETY.—Annual General Meeting, at 6 p.m.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.—Mr. H. Heathcote Statham, F.R.I.B.A., on "A Threefold Aspect of Architecture: Tradition—Character—Idealism," at 8 p.m.

Wednesday, April 15.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Annual Business Meeting; President's Valedictory Address, at 8 p.m.

MANCHESTER SOCIETY OF ARCHITECTS.—Social.

Saturday, April 18.

EDINBURGH ARCHITECTURAL ASSOCIATION.—Visits to Lady Stair's House and Trinity College, Jeffrey Street.

Monday, April 27.

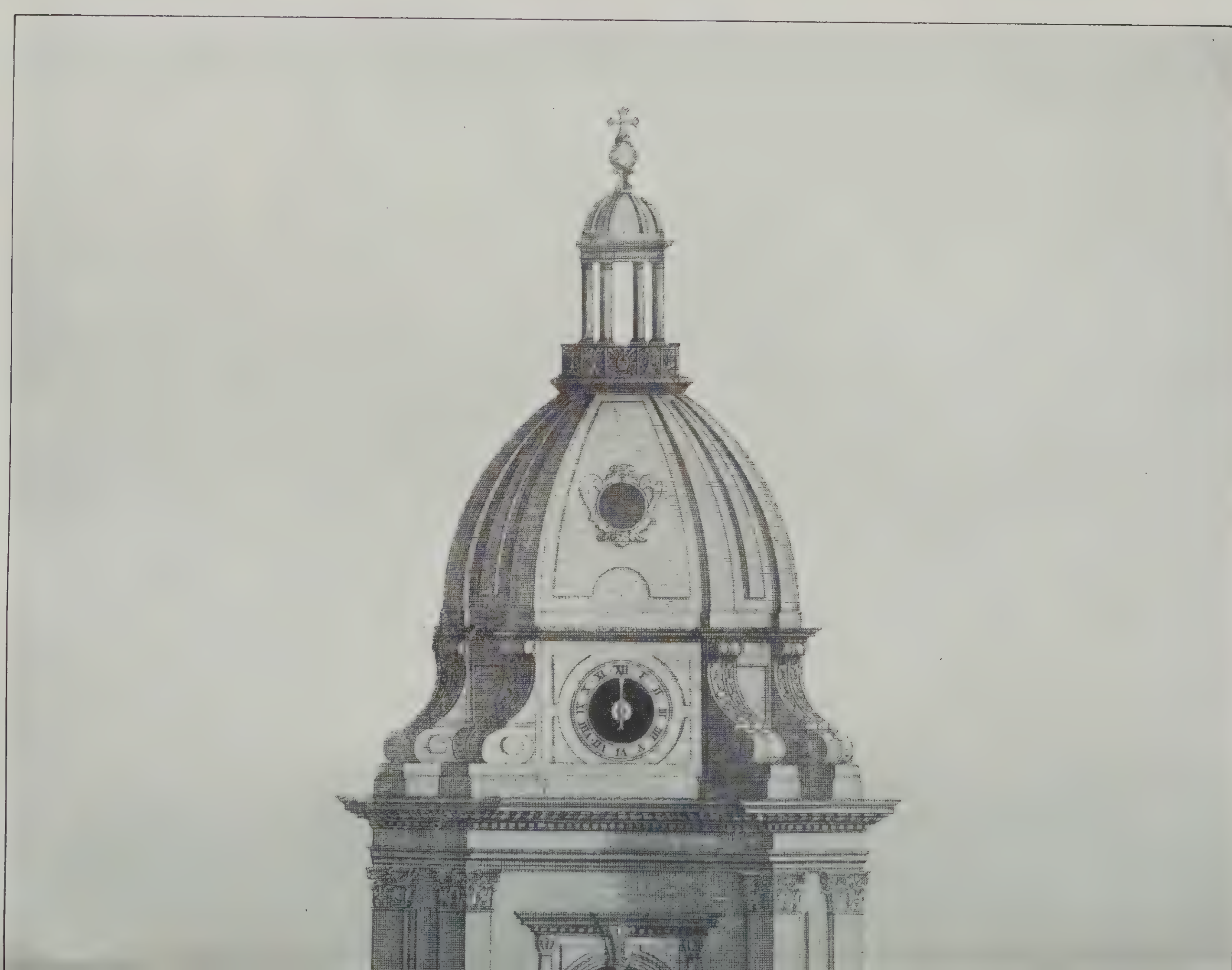
SURVEYORS' INSTITUTION —Paper on "The Modern Education of a Land Agent," at 4 p.m.

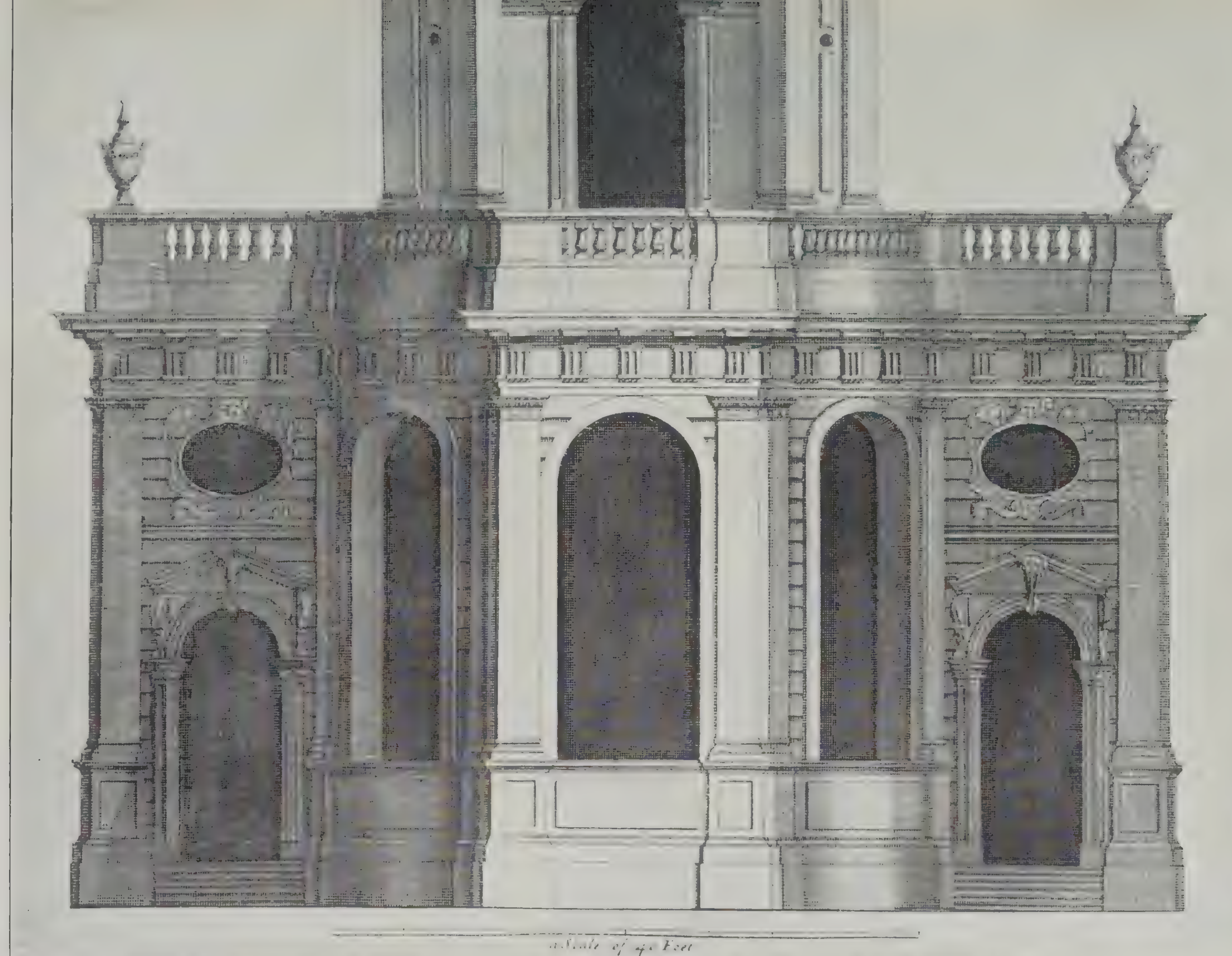
Insurance.

Subscribers to "The Builders' Journal" are entitled to a Free Insurance for £500. Every subscriber should apply for this, sending a postcard with the name of the newsagent with whom the order has been placed. Subscribers can also obtain a General Accident and Sickness Insurance (the "Lighthouse" policy) at a reduced premium, which includes the Annual Subscription to this Journal. A pamphlet giving full particulars can be obtained free on application.

Free £500 Accident Insurance Coupons have this week been sent to the following:

N. H. (Westminster), W. E. G. (Neath), H. G. (Manchester), M. A. R. (Londonderry), F. L. T. (Newcastle), H. T. W. (Leeds), R. G. S. (Orpington), J. C. (London, W.C.), J. P. P. (Stockwell), P. M. (Exeter), W. L. (Uphall), T. C. F. (Hammersmith), T. W. (Belper), H. R. Y. (Leicester), J. J. (Paisley), A. E. B. (High Wycombe), J. D. D. (Westminster), G. C. (Tooting), J. H. P. (Kilburn), W. B. (Hoddesdon), H. D. C. (Balham), G. S. (York), F. J. T. (London, S.W.), T. W. (London, E.C.), W. S. W. (Colwyn Bay), E. F. (Hammersmith), W. M. (Carluke), F. W. P. (Bexhill), W. J. A. (London, E.C.), T. M. (Southport), H. W. B. (Halifax), F. R. (Chesham Bois), W. J. S. (Birmingham), F. P. (Retford), A. W. H. (Leytonstone), H. C. (Gunnersbury), E. M. W. (London, W.C.), J. H. (Chatham), F. L. T. (London, S.E.), G. H. W. (Manchester), W. H. A. (Clapham), P. K. A. (Tunbridge Wells), J. G. (Bonnyrigg).





ST. PHILIP'S CHURCH, BIRMINGHAM: EAST ELEVATION   THOMAS ARCHER, ARCHITECT.

April 15, 1908. Volume 27 No. 688

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

International Congresses of Architects & their Practical Results. A record of the transactions of the International Congress of Architects held in London in July, 1906, under the auspices of the Royal Institute of British Architects, has recently been issued in book form to the members of that Congress. In view of the near approach of the eighth International Congress of Architects, to be held in Vienna from May 18th to June 14th next, the time seems opportune for a brief review of the work of the last Congress, with special reference to the practical results obtained by the various discussions which took place on that occasion. With regard to Subject I, "The Execution of Important Government and Municipal Architectural Work by Salaried Officials," three papers were contributed by Herr Otto Wagner (Vienna), Monsieur Oscar Simon (Brussels), and Monsieur Gaston Trélat (Paris), and the following resolution was carried: "*That, in the future, in the interests of administrative bodies and the public, and in the higher interests of the art of architecture, public bodies, whether government, provincial, or municipal, should entrust important architectural works only to professionally qualified architects, either by competition or otherwise.*" Nearly two years have elapsed since this resolution was carried, and we should be interested to know what steps have been taken in the interim by the Royal Institute of British Architects to give effect to the policy which the Congress considered it was desirable to adopt in "the higher interests of the art of architecture."—As a result of a lengthy discussion on the question of "Architectural Copyright and Ownership of Drawings," the meeting arrived at the sapient conclusion "*that the architect is employed to produce a building,*" and added the following words: "*and all drawings and papers prepared by him to that end are undoubtedly his property.*" Here is a very definite expression of opinion upon a subject which has over and over again caused trouble and litigation, but despite this fact no attempt whatever has been made by the Institute to revise its badly-drafted, ambiguous, and misleading Schedule of Professional Charges.—Nine papers were contributed to Section III., "Steel and Reinforced Concrete Construction," but as the two resolutions adopted were of a strictly non-committal character, we need do no more than record them: "*That it is the sense of this meeting that an enquiry into the cases of failure in reinforced concrete and their causes would be most desirable.*" "*That where reinforced concrete is intended to be fire-resisting, the greatest possible care must be taken as to the nature of the aggregate and its size, and also as to the protection of the steel.*"—The juxtaposition of Subject IV., "The Education of the Public in Architecture," with Subject V., "A Statutory Qualification for Architects," offers a considerable amount of food for reflection.

Education and Registration. With regard to the former, we are strongly of the opinion that until architects have made a serious effort to deal with the question of their own training and education it is premature, not to say impertinent, for the profession to attempt to assume a didactic attitude towards the general public. Besides, how can architects reasonably expect the general public to evince any very great amount of enthusiasm for the study of an art which some of its most successful practitioners declare no amount of study or hard work will enable anyone to acquire? No resolution was adopted on Subject IV., but it seemed to be the opinion of the meeting that, after all, the best means of educating the public in architecture is by the production of well-designed buildings. We agree, but having regard to existing circumstances and conditions, whereby able and scholarly designs for public buildings are, as a very general rule, rejected by assessors, how are the "well-designed buildings" to be obtained? Until this unfortunate position of affairs is remedied by architects, we think the less said the better concerning "The Education of the Public in Architecture." Subject V., "A Statutory Qualification for Architects," attracted some ably written papers from seven members of the Congress resident in Canada, France (2), Germany, Cork, Tasmania, and Budapest, and a resolution, applying to all countries officially represented at the Congress and drawn up in the following terms, was adopted: "*That it is desirable, in the interests of the public and the profession of architecture, that all practitioners should have a statutory qualification.*" It would appear that English architects do not stand alone in their demand for education as a necessary means of self-protection, and it is satisfactory to observe that their brethren in other countries agree with them in thinking that the only hope of rescuing the art of architecture from its present, more or less, universally decadent position is for its practitioners to insist upon the adoption of a compulsory and thoroughly comprehensive system of technical and artistic training intended to apply to all persons desirous of becoming members of the profession. Much bitter feeling has been aroused in this country over the harmless proposal to institute a compulsory system of architectural training. We trust that the expression "they manage these things better abroad" can be fairly applied to foreign architects, even to that section of the profession (if there be one) which pins its faith upon the architectural achievements of the "untutored genius." The result obtained by the discussion of the subject matter comprised in Sections IV. and V. seems to indicate a stage in the controversy in which those in favour of statutory qualification and those opposed to it are alike convinced that the public "suffers from the ignorance of unqualified practitioners," but whilst the advocates of statutory qualification desire to alleviate the sufferings of the patient (the public) by placing him under the care of a properly-trained and skilful surgeon (the well-educated architect), those opposed to statutory qualification profess (to say the least, somewhat inconsequently) to see the remedy for his tortures in the education of the patient himself!—Subject VI., "Architecture and Craftsmanship," attracted sufficient attention to draw forth an academic discussion, of no great practical value, and Subject VII., "The Planning and Laying out of Streets and Open Spaces," comes in much the same category.

Academic Discussion and Useless Proposals. —The resolution arrived at after due discussion of Subject VIII, "The Architect's control over Artist Collaborateurs," was as follows:—*The architect in the construction of a building is to be given absolute power over the co-operating craftsman, but in a special manner over the co-operating artist.*" In the absence of any information as to what is meant by the expression "in a special manner," the above resolution appears to us to be utterly useless.—As to Subject IX., "The Responsibilities of a Government in the Conservation of National Monuments," the following resolutions were adopted: "*That in all countries the Governments should be authorised to obtain, if necessary, compulsory expropriation in every case where a monument possessing historical, artistic, or archæological interest, is not kept in a proper state of preservation by its owner.*" "*That this Interna-*

tional Congress of Architects recommends that the British Government be approached with a view to appointing a Royal Commission to control and extend the operations of the Ancient Monuments Protection (Amendment) Act of 1900, and to prepare an accurate catalogue of all ancient monuments, whether historic or prehistoric, taking similar action to that of the Department of Historical Manuscripts, and in agreement with the measures adopted by other countries." Has the British Government been approached with the object suggested in the second resolution, and by whom?—In the light of recent events, the second of the two resolutions adopted at the conclusion of the discussion on "The Conduct of Architectural Competitions" (Section X.) comes rather in the nature of a surprise. It runs:—"*The competition programme should declare that the members of the jury, by the fact of their acceptation of their office, have not and will not have, directly or indirectly, any material interest in the execution of works put up to competition.*" We should like to know by whose direction and under whose authority this very desirable regulation has been ignored by the Royal Institute of British Architects.—We have been at some pains to ascertain to what extent architectural congresses are of practical value to the profession in general, and we must confess we are much disappointed in feeling bound to express the opinion that there is not, and probably never was—at least, as regards this country—the slightest intention of giving effect to any of the resolutions carried during the last Congress, although many were only adopted after a debate of a more than ordinarily wearisome nature.

A Righteous Resolution.

Builders and the Territorial Army.

At the recent annual meeting of the Southampton Master Builders' Association a resolution was passed unanimously affirming that members of that Association would give "every encouragement and all facilities possible" for the purpose of employees attending drills and camp under the Territorial Army scheme. The retiring president, Mr. H. Marshall, said that in the event of the scheme failing, the only course open to any Government was conscription, which, besides being distasteful to Englishmen, would cause considerable inconvenience to employers of labour. (Mr. J. P. Beer was elected president in succession to Mr. Marshall, and Mr. W. R. Franklin was elected vice-president.)

The Granite Question at Birmingham.

At their meeting last week, the Birmingham City Council, by 39 votes to 30, decided to use Aberdeen granite for the base of the Council House extension, and accepted the tender submitted by Messrs. Fyfe, Ltd., amounting to £7,774; this in spite of the fact that the General Purposes Committee (to whom the matter had been referred for detailed particulars) reported in favour of Norwegian granite. In reply to the statement that the low prices quoted for Norwegian granite are due to the employment of "sweated" labour at the quarries, Messrs. Blichfeldt and Co. say:—"The Norwegian granite masons can and do earn more money than British masons. Trades-unionism among them is much more general than is the case with the same class of workmen in this country. The question of wages is far from being the cause of the low prices quoted for Norwegian granite. The true reasons are well known to most people in the trade, and the more pertinent can be summarised as follows:—(1) The quarries are situate alongside deep water in the fjords, enabling the granite to be loaded direct into steamers with practically no transport charges. (2) There is no overburden at the quarries; therefore no cost of removing waste, etc. (3) Norway being also a timber-exporting country, the combined shipment renders freights very cheap, timber giving bulk and granite the weight. (4) The granite is uniform and homogeneous, and splits so truly in horizontal and vertical beds that the amount of waste is infinitesimal. (5) There are no heavy royalties or interest to pay on heavy capital expenditure. All quarrymen know what the above advantages mean in relation to cost. The capital in the Norwegian granite industry is largely provided by Englishmen, some of whom also have considerable interest in quarries in the United Kingdom."

The Building Trade Lock-out in Paris.

A serious state of affairs in the building trade of Paris has arisen from the lock-out of the masons, which commenced last week. The 4,000 masters of the syndicate representing builders of the departments of the Seine, and of the Seine and Oise, employ, on an average, 350,000 workmen, which may be taken as an average of 200,000 for Paris alone. Most of the masons, of whom there are 20,000, are immigrants from Central France, from Auvergne, and the Limousin, which for three centuries past have furnished the ranks of the masons since the time when Richelieu recruited an army of them to work on the fortifications. There is, perhaps, no branch of trade better organised and more self-respecting and generally respected than that of the masons, but the evil influence of the general Labour Confederation appears to have obtained the upper hand over the internal organisation, and it is this which has brought about the present crisis.

A City Architect for Sheffield.

At last week's meeting of the Sheffield City Council a special committee, to whom the matter had been referred, recommended the appointment of a City Architect at a salary of £650 per annum. They also recommended: "(1) That although such officer would take his instructions from, and be responsible to, the several committees ordering the execution of works, such official and his staff should be under the general control of the Establishment Committee, and that the functions of that Committee be enlarged accordingly; (2) That all officers engaged on architectural work in the several departments of the Corporation, including the Education Department, be transferred to the City Architect's department; (3) That the Council should authorise this committee to issue advertisements inviting applications for the appointment of a city architect on the basis of this report, and that the applications should be considered by this committee, and a suitable candidate recommended to fill the office." At last Wednesday's meeting of the Council a letter was read from Mr. J. R. Wigfull, hon. secretary of the Sheffield Society of Architects and Surveyors, expressing the opinion of the Society "that as a general principle the placing of the design of all public buildings in a district in the hands of one architect, however eminent, is not conducive to variety and freshness of planning or design. This can only be obtained, in the opinion of my Council, where the work is distributed amongst different architects, and a healthy spirit of competition thereby promoted. Experience shows that an official architect has little time for actual designing, his time being fully occupied by administrative duties and attendance on committees. The designing is, therefore, deputed to assistants, with the result that buildings become stereotyped and commonplace, and yet, at the same time, frequently extravagant in cost. . . . ."

The West End Collapse.

No cause has yet been assigned for the collapse of the two houses in Castle Street East, off Oxford Street, London, which took place early on Monday, April 6th. At last week's inquest on the victims, the jury returned a verdict of "Accidental Death," adding that there was no evidence to show why the houses collapsed, and that there was no evidence of an explosion. The following statement was made by Mr. Arthur Ashbridge, F.R.I.B.A., district surveyor for St. Marylebone: "Looking at the ruins, it is to be seen that the whole of No. 72, Castle Street fell, and the upper part of No. 71, leaving No. 70 still standing. No. 72 was rather more than usually well shored up. It had four rakers and four stout scaffold poles set against its east wall, and three other shores against the north, or Castle Street, wall and the back." The leaving of the matter in this undecided state cannot be regarded as satisfactory.

A Glazed Brick "Combine."

Negotiations which for some time have been in progress between makers of glazed bricks have now been brought to a successful issue, and a uniform price list, which has been formally adopted by the whole trade, is said to be in the hands of all parties to the agreement. By the end of the year a fund of £15,000 will exist as a guarantee of the fulfilment of all mutual obligations. The "Yorkshire Daily Post" says: "The unremunerative character of all recent trading is a matter of notoriety. Building trade conditions have made deliveries small, and competition between makers has destroyed profits. With the economies in production introduced, and a combination of this power, much better results than of late are expected from this important Yorkshire industry." The "Manchester Guardian" makes the following comment: "Negotiations have been proceeding quietly for some time past, and pains have been taken to maintain close secrecy. We are able to say, however, that a material advance in the low prices prevailing is contemplated, and that the combination embraces the whole trade. . . . Makers of glazed bricks consider themselves to have been the worst sufferers from the depression in the building trade."

Aggressive Plumbers.

We have received the following communication from the National Association of Master Heating and Domestic Engineers:—The aggressive policy which the plumbing trade has adopted during the past few years of demanding a monopoly of fixing and fitting pipes in all metals (whether

lead or not) for domestic hot-water supply services has encountered another check with the termination of a dispute raised by the Operative Plumbers' Society at the new annexe to Winwick Asylum, near Warrington. The contract for this was placed by the architect in the hands of an engineering firm who are members of the National Association of Master Heating and Domestic Engineers, and who followed the recognised practice by putting on fitters to do the work, which is in hard metal. When the work was in progress the officials of the Operative Plumbers' Society at Warrington and Manchester interfered and claimed it for their trade, asserting that such work is a monopoly of plumbers, and must be done by them alone. They threatened a strike on their own legitimate work if their demand was not conceded. Lead-work was not being touched by the fitters. The architect and representatives of the Asylum Committee, and also the engineers, met the plumbers in a conciliatory spirit, but nothing would satisfy the latter but an absolute surrender to their demand, and a recognition of their claims to a monopoly of the work. To enforce this, and without regard to the pressing necessity that the asylum should be completed as rapidly as possible for the reception of the unfortunate sufferers waiting accommodation, the plumbers stopped their work on February 4th. A further effort was made by the asylum authorities and the engineering contractors to bring about a settlement, and they applied to the Board of Trade for the appointment of an independent and responsible arbitrator; the arbitration, however, could not be proceeded with without the plumbers' concurrence. The plumbers maintained their block on the contract for about six weeks, during which time they did none of their own work. They have now, however, returned to it unconditionally, and the fitters have completed the work in dispute. The case reported is typical of a number of disputes which have recently been caused by the plumbers in several places, mostly in Lancashire. With a view to obviating such occurrences, the National Association of Master Heating and Domestic Engineers, and also the operative fitters in this trade, are agreeable to submit the whole question to the arbitration of the Board of Trade in order to obtain a settlement on a national basis. This arbitration scheme actually originated in a resolution proposed by Mr. E. E. Burns, general secretary of the Operative Plumbers' Society at a joint conference at Leicester on June 12th last. The operative plumbers have, however, receded from this resolution and declined to proceed to arbitration. The Comptroller-General of the Labour Department of the Board of Trade quite recently again offered national arbitration to the executive of the Operative Plumbers' Society, and received a reply that the Society are unwilling to participate in such proceedings. In the circumstances the responsibility for such regrettable disputes as that at Winwick Asylum lies upon the plumbers, whose endeavours to deprive a kindred class of workmen of their recognised and legitimate occupation are against the best interests not only of public authorities, architects, and contractors, but of the workmen themselves.

A Norman Castle as a Technical Institute. On the west side of the River Usk at Newport, lying between the railway bridge and the road bridge, are the ruins of Newport Castle—a Norman fortress. Once occupying an isolated site, the old building is now hemmed in by a red-brick building, which totally kills any good effect it ever had. The castle itself has been used at various periods as a nail factory, a blacksmith's forge, and a brewery; and, at one time, its keep was even disgraced by a flaunting notice-board of the local music-hall. The brewery was the latest of these incongruities. Lord Tredegar, on purchasing the larger share of the place some years ago, decided to clear out all the modern excrescences, and to leave standing only what were found to be the old walls. For a couple of years the work has been carried on under the direction of Mr. W. D. Caröe. His lordship has now offered to hand the castle over to the town, to be used, if thought suitable, as the home of the technical institute which is in contemplation. We do not wish in any way to disparage this generous offer, but we cannot regard the suggestion as anything but hopeless, because, clearly, it would be impossible to meet modern requirements inside the lines of a Norman castle, and the Corporation would be foolish if they attempted to do so. The technical institute is a modern creation and can only be properly dealt with on modern lines.

Views and Reviews.

The Palace of Peace Designs.

The international competition for the Palace of Peace at the Hague was one of the biggest disappointments in competitions that has taken place for some time, because not only was the selected design, by L. M. Cordonnier, a very feeble specimen of architecture, but the majority of the other designs submitted were on an almost equal plane of inferiority. Certainly the designs submitted by English architects were no means great, though Mr. Belcher's went some way to establish a good position, while the Continental competitors seemed to have vied one with another in producing quite extraordinary conceptions, such for example as those of Emil Töry (Budapest), Félix Debat (Paris), and G. Mancini (Rome). Among these "strange" designs, however, we must except those submitted by E. Saarinen (Helsingfors), Otto Wagner (Vienna), and Eduard Cuypers (Amsterdam), which, while showing a riotous abandonment of all precedent in monumental design, are undoubtedly full of much original work of great ability. The six premiated designs, together with 40 others (out of a total of 216) selected by the Society of Architecture at Amsterdam, have been published by Messrs. T. C. and E. C. Jack, of London. The reproductions are to a large scale, executed in the best possible manner, and each design is accompanied by a biographical notice of the author. It would be unfortunate, however, if such a collection as this were ever taken by a generation to come as representing the best work of the present day. Most of the designs submitted are better forgotten. The publication has, as frontispiece, an excellent photograph of Mr. Andrew Carnegie, who provides the funds for the proposed building, and a photograph is also given of the international jury who assessed the designs submitted. This latter we take the liberty of reproducing. The jury met under the presidency of Mynher Van Karnebeek, chairman of the Board of Directors of the Building Committee, and comprised Messrs. T. E. Collcutt, P.R.I.B.A. (London), Dr. P. J. H. Cuijpers (Amsterdam), architect of the National Museum; E. von. Ihne (Berlin), Imperial Architect to H.M. the German Emperor; C. König (Vienna), professor at the Technical University; H. Ne-

W. R. Ware. H. P. Nénot. Dr. P. I. Cuijpers. T. E. Collcutt. Jhr. Mr. A. P. C. v. Karnebeek (*President*). E. v. Ihne. C. König. D. E. C. Knuttel (*Secretary*).

THE JURY OF ASSESSORS IN THE PALACE OF PEACE COMPETITION.

sor at the Technical University; H. Nénot (Paris), president of the Central Society of French Architects; and W. R. Ware (Milton, Mass.), ex-professor of architecture at Columbia University; the State architect of the Netherlands acting as secretary.

"The Palace of Peace at the Hague." London: T. C. and E. C. Jack, 16, Henrietta Street, W.C.; price £4 4s. in portfolio.

Some Excellent Measured Drawings.

The second volume of the portfolio of measured drawings issued by the School of Architecture of Liverpool University, under the direction of Professor Reilly, is before us. From the preface we gather that the first volume was a great success, the proceeds of the sale having furnished the funds for two travelling scholarships to Italy. The drawings given include some of the Bank of England in Castle Street, Liverpool—a particularly fine design by Cockerell, well meriting being placed on record in this form. We reproduce on the opposite page a detail of the elevation, and we take the following from the letterpress:—"The Order is Roman Doric, but fluted after the Grecian manner, and the mouldings everywhere are Grecian in their refinement. Nothing could exceed the delicacy of the carving around the necking of the columns and the rusticated angle pilasters. The entablature to the main Order is full of interest; the triglyphs have disappeared with the exception of their guttæ, which appear at widely spaced intervals, and the frieze ornament consists of a bold Greek fret. The upper storey of the front is set back, so that the Order does not carry anything beyond its own entablature and the curious balustrade, which has no base, and is therefore set forward over the fascia of the cornice and divided up into three balconies, with a square baluster at the corners. The setting-back of the upper part of the front enables the cornice to the attic, which springs from piers almost faceable with the Order, to throw a deep shadow, and to become thereby, with its pediment, the dominating feature of the composition. The cornice is further strengthened with curved brackets grouped in pairs, which recall the triglyphs omitted from the entablature to the Order below."

The other drawings in the volume include those of the Queen Anne Block at Greenwich Palace, the University Library at Cambridge, the Porta Nuova and the Porta Palio at Verona (by Sanmicheli), Morden College, Blackheath (a most interesting building by Wren); St. Paul's Church, Liverpool; the screen in Lincoln College Chapel, Oxford; the Bevilacqua, Verona; Speke Hall, Lancs.; and some details of the entrance gates of the Petit Trianon, Versailles.

The book is produced in a very admirable manner, and we wish it the success which the first volume has attained.

"Portfolio of Measured Drawings, School of Architecture, Liverpool University," Vol. 2. Edited by Prof. C. H. Reilly, M.A., and Mr. Patrick Abercrombie. London: Crosby Lockwood and Sons, 7, Stationers' Hall Court, E.C.

An Easter Tour to Scotland for Architectural and Engineering Students has been arranged by the Regent Street Polytechnic. Visits will be paid to the granite quarries at Aberdeen, to the Forth Bridge, and other places of interest. The trip starts to-morrow, Thursday, April 16th, and concludes early on Tuesday morning, April 21st. The cost, including hotel accommodation, is three guineas to students, while friends may join for 5s. extra.

THE A.A. DINNER.

The annual dinner of the Architectural Association was held at the Gaiety Restaurant on Thursday evening last, with Mr. Walter Cave (president) in the chair. The company numbered about 120, the guests including Mr. T. E. Collcutt (president of the Royal Institute of British Architects), Mr. Edwin A. Abbey, R.A., Mr. George Frampton, R.A., Mr. Alfred East, A.R.A., Mr. Lewis F. Day, Mr. Ian MacAlister (the new secretary of the R.I.B.A.), Mr. H. Greville Montgomery, M.P., Lt.-Col. A. C. Preston, V.D. (Master of the Carpenters' Company), Mr. W. Lawrence (president of the Master Builders' Association), Mr. W. Langridge (president of the Junior Institute of Surveyors), and Mr. J. G. Peacock (president of the Clerks of Works' Association).

After the Royal toast had been given, Mr. Arthur Keen proposed "The Royal Institute of British Architects." He spoke of the friendly relations which subsisted between the Institute and the Association, and made acknowledgment of the advice and practical help which the older body was always ready to give to the younger one, especially in connection with its educational work. The point had been raised that too much time was given up at the Institute meetings to questions of business, but he thought we should remember that while something might be said on this point, there was no doubt that the position arose partly out of the fact that the Institute was now getting into closer touch with governing bodies, who looked up to it more and more as an authority, which he thought was a good thing.

Mr. Collcutt, who replied to the toast, expressed himself in accord with Mr. Keen, and observed, with satisfaction, how the Institute was now listened to by the Government, the London County Council, and other important public bodies. Turning to the Association, he said that he had been connected with it longer perhaps than any other person in that room, his connection going back fifty years. He remembered how, in 1857, he had heard papers read at meetings of the Association held in "Lyons' Inn," and he recalled the fact that the Association was the principal educational body for the profession then, as now. The Association was still doing the pioneer work for the education of the architect in this country; indeed it might be said that the Institute was recruited from the Association, the members of the Association of to-day being the members of the Institute of to-morrow.

Mr. H. Greville Montgomery proposed the toast of "The Architectural Association." He took occasion to make reference to the parlous state of the brick-making industry in this country at present, and proceeded to make some comments on the relative value of brickwork and reinforced concrete, recommending members of the Association to investigate the matter for themselves. Mr. Lewis Harcourt, First Commissioner of Works, had told him, when visiting the last Building Trades' Exhibition, that he had introduced reinforced concrete into the Post Office because it saved many thousands of pounds. He (Mr. Montgomery) expressed the hope that the buildings would last as long as the present Government!

Mr. Walter Cave replied to the toast. He said that the Association was now entering upon its 61st year, with a membership of no less than 1,750, the growth during the last ten years having been very rapid. As had been pointed out, the Association was essentially an educational body, and to-day they found themselves in the front rank; their Day School included 64 members, their Evening School 84 members, while about 100 students also attended lectures in the Evening School. Their work was improving year by year, and it was gratifying to know that the Board of Education, which had recently visited their School, had sent to the Council an eminently satisfactory report. During the past six months a "life" class had been established, and had proved a real success, the present membership being 30—which was the limit. Continuing, Mr. Cave said he had always considered how important it was that the athletic side of the Association should be developed in conjunction with the educational side. Much had been done in this respect. Cricket, football, hockey, swimming and rowing clubs had been formed, and now they had their rifle club as well, where he himself had established a record by firing seven shots at the target without hitting it! The A.A. Musical Society had also done good work, and they had to offer their congratulations to those who took part in, or were connected with, the production of the A.A. play this year; it was an unquestionable success, and had proved as well to be a financial success, for, after paying all expenses, £8 had been handed over to the Architects' Benevolent Society. This led him to make the interesting announcement that the building debt of the Association was now extinguished; they had paid off £10,326, by their own efforts and with the assistance of generous friends of the Association. He had much pleasure in announcing also that a scholarship of £120 a year had been offered by an unknown benefactor to the Association. It would not come into force just yet, but was something to look forward to. The matter was not at present sufficiently settled to allow him to make any definite announcement, but he might mention that the holder would be required to pass certain examinations and to spend from six to twelve months in Italy in connection with the British School at Rome.

The toast of "The Guests" was proposed by Mr. Louis Ambler, and seconded by Mr. Alfred East, A.R.A.

During the evening selections from the Gilbert and Sullivan operas, and other music, were given by Miss Leonaro Sparkes, Miss St. Clair Hamilton, Mr. Ernest Pike, and Mr. Arthur Strugnell, and some humorous stories were contributed by Mr. Frederic Upton.

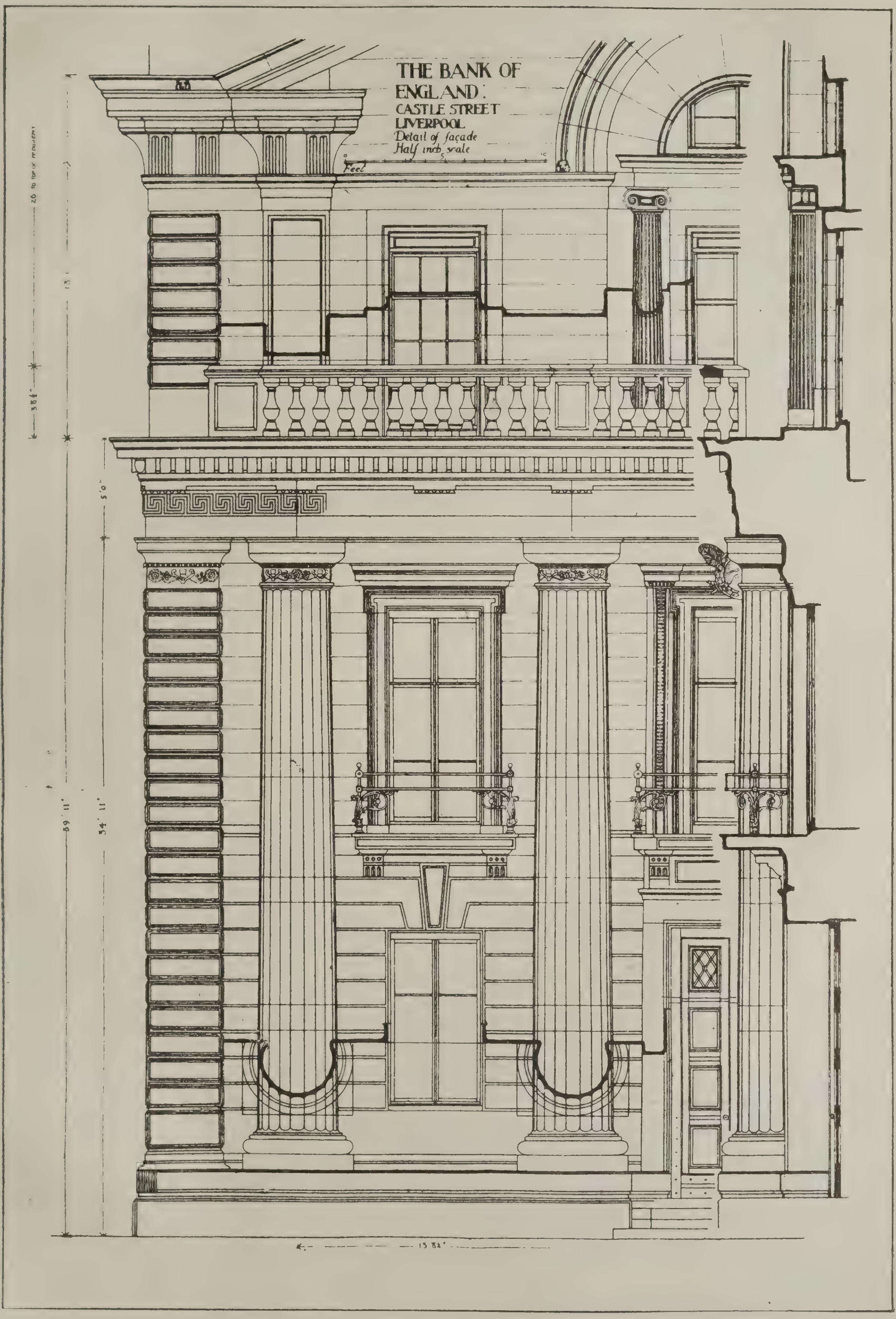
R.I.B.A.

A meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., the chair being occupied by the president, Mr. T. E. Collcutt.

The hon. secretary announced the decease of the following two members of the Institute:—Leopold Eidlitz, hon. member, elected 1898, and Charles Frederick Reeks, elected an Associate in 1848 and a Fellow in 1860.

Mr. H. Heathcote Statham, F.R.I.B.A., read a paper on "A Threefold aspect of Architecture: Tradition—Character—Idealism."

A vote of thanks was proposed by Sir Aston Webb and seconded by Mr. John Slater.



(From Vol. 2 of the Portfolio of Measured Drawings issued by the School of Architecture, Liverpool University.)

ARCHITECTS' REGISTRATION IN AMERICA.

Some Facts and Recommendations.

A committee of four (comprising Mr. William B. Ittner, Mr. Peter B. Wight, Mr. A. F. Rosenheim, and Mr. Charles P. Baldwin) has recently presented to the American Institute of Architects a report on the subject of architectural registration in America. The following is a summary of their remarks:—

The examination and registration of architects in the United States (or, as it is sometimes called, the "licensing of architects") is already an accepted fact in Illinois, in New Jersey and in California: in Illinois the licensing law has been in force for more than ten years, and in New Jersey and California for a shorter period. In Illinois there are 700 licensed architects.

Already the Province of Quebec of Canada has a license law, which is enforced by an incorporated association of architects, and the proposition now before the British Parliament is to place the power for licensing architects within the Royal Institute of British Architects only. In Europe there is something similar to a licensing system in France and Germany; but in these countries only certain architects are given an official status by reason of special appointments. There, however, everything in the nature of licensing has a tendency to create an aristocracy of architecture, which would not be possible in the United States under any circumstances.

An architect's license law must necessarily be enacted under the police powers given to the legislatures of the several States by their constitutions, to regulate the acts of incompetent persons, or even prevent incompetent persons from performing acts which might result in danger to the community. It is very clear that such laws should be enacted rather on the demand of those who need such protection than of those who are to be regulated by it. And this brings us immediately to a consideration of

The General Misunderstanding Among Architects

in places where such laws have not been enacted as to their true meaning and purpose. No laws which regulate the practice of architecture in the interests of architects should be or ever will be enacted. It is the people only who should be interested in their enactment. Architects are only affected by the enforcement of such laws, and the architectural profession will never feel the full force of the benefit conferred upon it by these laws until a number of years after their enactment. It would perhaps be fair to say twenty years would be the time necessary for the full benefit to be appreciated.

Results of the Illinois Law.

If a careful investigation of the results of the Illinois law, so far as they bear upon the architects, were made now, after it has been ten years in force, there is no doubt but that the resulting benefits to the architects themselves would be greatly in evidence. In ten years from the present time, or, more certainly, twenty years, there will be scarcely any practising architects in the State of Illinois who have not passed an examination, and have been approved by the examining board of that State. At the present time nearly one-third of the architects of Illinois are holders of examination licenses, but there still remain the two-thirds who obtained licenses without examination on the mere affidavit that they were practising architecture when the law went into effect, among whom necessarily there must be a large number of men having very little qualification or competence to practice their profession; and it is not likely that any great number of these men will have their licenses revoked for incompetence, the power to do which is conferred upon the State board.

Among these men are naturally a large number with little or no artistic attainments; but yet many of these latter may be skilled in construction, sanitation, and the other qualifications required by the law. And this brings us to a consideration of

A Further Misunderstand ng

on the part of many architects who desire that license laws shall establish the artistic qualifications of architects, such as is contemplated in the registration law now before the British Parliament. This is unconstitutional and impossible in the United States. Therefore such laws can only be advocated in the interests of those who seek protection from the results of want of skill in construction on the part of architects, and recklessness in carrying on their work, rather than from those who are desirous that a higher order of artistic merit should prevail in our profession. Hence the indifference of many of the leaders of the profession, who are in well-established practice, to the whole question.

Architects Not the Prime-movers in the First Licensing Law.

While the Illinois law had been contemplated and talked about among architects for several years, no attempt ever was made to have such legislation until a very serious building accident (due to the incompetence of a young architect in supervising his work) incited a very large and well-organised trade union of mechanics to suggest that such a law be passed. They were very insistent in the matter; but not knowing how to go about it, they appealed to the Chapter of the American Institute of Architects in their city, not knowing that this Chanter had ever been seriously considering what kind of a law could be framed. The Chapter acted in the interests of this union in what it did in preparing a draft for the law and advocating its passage, which was subsequently adopted; but the Chapter went further — it anticipated opposition, the same opposition which has arisen in several other States in which such propositions have been defeated by their legislatures. They not only had the powerful political influence of the trade union, but they called in the assistance of other organisations which might have to do with building operations, such as associations of employers of mechanics, and real estate dealers. Thus it will be seen that the first architects' license law was the evolution of an effort for self protection on the part of large numbers of persons. It was passed without amendment. The laws of the two other States—New Jersey and California — are neither of them as perfect or effective, and for that very reason there have been more difficulties in enforcing them, and naturally they been more subject to criticism.

The Enforcement of Professional Ethics.

The American Institute of Architects has a greater field for usefulness in the enforcement of professional ethics among architects and between architects and their clients than in seeking legislation, because the very fact that it seeks it lays it open to the charge of personal interest. It has before it also that other great field of activity in fostering educational movements and developing the artistic abilities of those who are practising our profession.

In consideration of all of these reasons the committee has come to the conclusion that the licensing of architects is not a subject on which the American Institute of Architects should take any official action; but that the whole matter should be recommended to the Chapters in the several States, and that the Chapters should first carefully consider whether there is a necessity for regulating the profession of architecture in their States, and, if they do, that they should first enlist the assistance of those who are most immediately interested in having protection from the acts of incompetent, reckless and dishonest architects.

Correspondence.

The Re-erection of Famous Buildings.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—The leader on this subject in your issue of April 8th is gratifying to me, inasmuch as the suggestions of Mr. Theodore Birnbaum and Mr. Leopold Wagner do but revive the original plea I first made, very many years ago, that interesting old London buildings should, when possible, be re-erected in the form of a genuine "Old London Street" in some appropriate situation.

When writing and illustrating a detailed survey of the district then about to be cleared in connection with the Strand to Holborn improvement, a district abounding in beautiful Adam shop-fronts and other charming features of that period, now irretrievably lost, I suggested the formation of such a street. I mentioned the grounds of the Crystal Palace as a possible site, lacking a better one, and suggested further that the interiors of the houses should be used as a museum for London antiquities.

Since first ventilating my ideas on the matter I believe a most successful street has been erected on these lines in Sweden.

Yours truly,

FRANK L. EMANUEL.

London, W.

The Seven Dials' Pillar.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Under the heading of "The Re-erection of Famous Buildings," you quote Mr. Leopold Wagner's query: "What has become of the original Seven Dials' pillar?" This question is readily answered. It may be seen at Weybridge, three-quarters of an hour's run from London on the South-Western Railway. An illustration of it is given on p. 454 of "The Book of Sundials," collected by the late Mrs. Alfred Gatty (1889), as well as in the enlarged subsequent edition, published in 1900 (page 125). The letterpress which accompanies both editions is as follows:—

"The 'Seven Dials,' which gave their name to a district in the parish of St. Giles-in-the-Fields, were, curiously enough, only six in number. They formed the six faces of a block of stone which crowned a Doric column, and each dial fronted one of the streets which met in the open space where the pillar stood. Two of these streets opened into one angle, so that the seventh formed an irregular star, as described by John Evelyn. 'I went,' he writes, October 5, 1694, 'to see the building near St. Giles', where seven streets make a star from a

Doric pillar placed in the middle of a circular area, said to be built by Mr. Neale, introducer of the late lotteries.' "

Cunningham, in his "Handbook of London," says: "It was removed in July, 1773, on the supposition that a considerable sum of money was lodged at the base. But the search was ineffectual."

The old column spent some time in a stonemason's yard, and in 1822 was bought by the inhabitants of Weybridge, and set up on the Green as a memorial to the Duchess of York. It is mounted on a square base and crowned by a very inartistic object—a ducal coronet; while the block of stone which formed the six dials, and in which the holes filled with the lead which had fastened the gnomons can still be seen, lies embedded in the ground near the neighbouring "Ship" Inn, after having been used for many years as a mounting block.

Yours truly,
HARRY HEMS.

Exeter.

Possibilities in Tile and Faience Work.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—I read with much interest in your issue for March 25th the paper on "The Decoration of Steel and Reinforced Concrete Structures" by Mr. James Salmon, F.R.I.B.A. It is suggestive and full of good points.

As a faïence and tile worker I was particularly interested in the remarks concerning terra-cotta, faïence (glazed terra-cotta) and tiles. Mr. Salmon's idea of a sculptor in clay going to work upon a whole facade is, to him, a most delightful idea, but this presupposes an unlimited time for execution (for, I suppose, no sculptor's ideas run like water) and unlimited expense.

In dealing with architects upon work for which faïence has been required, I have never, yet, found them very agreeable to the ordinary lapse of time necessary for the preparation of faïence work (even of work requiring a good proportion of repetition), to say nothing of delays which arise, and are bound to arise, from time to time, even when the professional potter is at his best. What the sculptor let loose upon a facade with a limited knowledge of his palette and the potter's technique might accomplish against time would indeed be interesting to see.

The details concerning coring, shrinkage, and firing are of an elementary character and scarcely worth pointing out.

I am pleased, however, to note that a certain class of tile of foreign manufacture is pointed out as not hard-burned.

Perhaps, in time, the British Architect will come to recognise that our native clays can, and do, produce a better tile than those in question, and, as far as workmanship is concerned, the English tile-maker can easily outdistance his foreign competitors.

What is really required at the present time is that the architect should learn more about the capabilities of British clays and workmanship. If he will do this, he will find no lack of appreciation of his aims, and no effort spared by the British tile-maker to meet his requirements, either artistically or technically.

That there is a "great future" before the architectural potter in connection with reinforced concrete I am assured, but this will only come about by the potter and the architect working together, each with a clear understanding of the aims and capabilities of one another's art.

Yours truly,
Hereford. CECIL JONES.

Archæology Once More.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Under the title of "Archæology and Architecture," I contributed the following to your old "Architectural Causerie" in January, 1902:—

". . . and whereas we continually get foreign telegrams in the press concerning political affairs there (Athens), it is very rarely that one hears of the work of the various 'Foreign Schools' at Athens. Where archæological and architectural societies could work together would be in the publication of pamphlets giving a little more light on the various works being done on different soils, in addition to their regular *Journals*, which only find their way to the specialist or very keen enthusiast and not to the members of the architectural world generally, who only require more data given them to take more interest in buildings which really belong to them and not to the archæologist."

I fancy I remember you to have taken your *adieu* of archæology, but if it is not entirely incompatible with modernity as represented by reinforced concrete, fireproof tests, and iron and steel generally, I should like to refer your readers to a very interesting publication, "The Hellenic Herald," which is now doing what is advocated in the above extract. The editor is Dr. Pouptis, and the March issue has a page-and-a-half devoted to the work of the British, American, French, and German Schools in Greece. Dr. Pouptis writes that "no English paper is so closely in touch with the centres of archæological activity," and he promises to publish information only to be found ordinarily in the annual volumes of the various archæological schools and societies. The first evidence of this excellent idea bears out good promise of this being fulfilled, as may be judged from the rough *résumé* I append.

Yours truly,
MAX JUDGE.

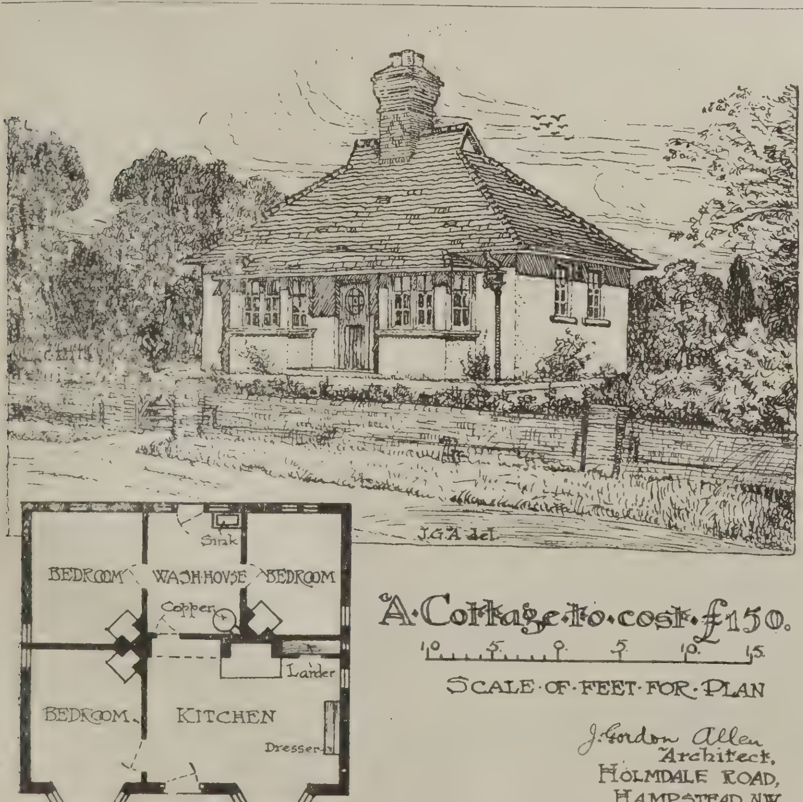
7, Pall Mall, London, W.

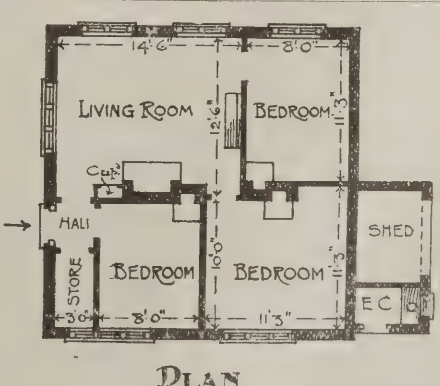
British School:—Mediæval remains in Chios. Excavations at Sparta which support Pausanias' description of the Temple to Athena—that the walls were covered with bronze plates (Chalkioikos).

American School:—Architectural remains at Corinth.

French School:—M. Holleaux's account of the work at Delos.

German School:—Discoveries at the Keramikos, which have "greatly increased our knowledge of the Keramikos, and especially have put us in possession of an accurate ground plan, from which it is clear that the 'eurythmia,' so characteristic of the Keramikos, is due to the influence of the Metic Hippodamos, the famous architect who remodelled Priene, Knidos and the Piræus, and who revolutionised ancient city-architecture."





These two small cottages have brick walls (rough-cast) with tiled roof. The cost of the smaller one, at 4d. per ft. cube, works out at less than £130.

THE DESTRUCTION OF ARCH BRIDGES.

Mr. H. C. Duncan Scott, M.S.E., read a paper on this subject before the Society of Engineers on April 6th, taking as examples some of the bridges on the L. and N.W.Rly. He commenced with the Oxheys and Broughton widening, which was about $3\frac{1}{2}$ miles long, and was carried out at a cost of £50,000. The blowing-up of Lightfoot Lane bridge, consisting of three brick arches, was chosen for description. "Tonite" was the explosive used on this work. Holes were "jumped" in the haunches and crowns of each arch, the former being charged with 224 ozs., and the latter with 192 ozs. of "Tonite." In addition, holes were "jumped" in the backing over the piers, and charged with 240 ozs. of "Tonite." Instantaneous fuses were fixed to the charges, grouped together and fired by time fuses, care being taken to prevent the charges exploding before their time. The crown shots in the centre arch were the first to explode, followed twenty seconds later by the crown and haunch shots of one of the side arches. A few seconds later the crown and haunch shots of the remaining side arch exploded, and then the shots in the top of the pier, which completed the destruction of the arches. One road was opened after $2\frac{1}{2}$ hours' work, and the other road $1\frac{1}{2}$ hours later; 95 men were engaged. The cost of destroying this bridge was £200. About 39 yds. to the west of the bridge is situated a chimney 100 ft. high, but no damage was caused to it by the explosion.

Following this description, Mr. Scott gave an account of a similar work in connection with a widening near Clifton and Lowther. The arch to be removed was a masonry one, with a span of 30ft. Holes were "jumped" in the crown, and charged with 9 ozs. of gelignite, the rest of the work being carried out in a similar manner to that in connection with Lightfoot Lane bridge.

A brick arch bridge of 20ft. span was also intended to be blown up at Preston, but the explosions ("Tonite" again being used) were not successful, and the arch was finally removed by hand.

In cases where explosives could not be used, Mr. Scott said the simplest method was to erect centres under the arches, which could then be removed by hand. If the headway were too small to allow of centres, ribs could be formed of boards bolted together, bent and wedged up to take the form of the soffit of the arch.

A FLOOR TEST.

On Wednesday last an experimental test was carried out on a reinforced concrete floor of the unusually wide span of 24 ft., at the works of the United Kingdom Fireproofing Co., Ltd., at Alperton. Several prominent architects had expressed wishes for a hospital ward floor of 24 ft. clear span and 12 ins. depth, without steel joists, and this test was the outcome. Fig. 1 shows the construction of the test floor in detail, from which it will be seen that the floor-slab was 12 ft. wide, resting on blue-brick piers well strutted against overturning. The reinforcing rods were flat steel bars each $1\frac{3}{4}$ ins. by $\frac{1}{4}$in., giving a total section of $5\frac{1}{4}$ sq. ins. in each beam. They were of ordinary mild steel, having an ultimate tensile strength of about 28 tons, and an elastic limit of about 18 tons. The bars were cranked up, as shown, to reinforce the beam against diagonal tension (often erroneously called shear). The beams and filling were made *in situ*, the tubes only being cast separately in moulds. These tubes were each 3 ft. wide by 7 to $7\frac{1}{2}$ ins. deep by 12 ins. long, with a thickness varying between $1\frac{1}{4}$ and 2 ins., and they formed a permanent centering between the boards, which were strutted up just to serve to form the soffit of the beams. The tubes were below the neutral surface of the beams, and consequently added no strength to the floor, except perhaps as lateral support to the beams, and a support to the slab between, as well as rendering the floor sound-resisting. The real construction of the floor was thus virtually a ribbed slab or series of T beams. The floor was given 1 in. camber. The concrete of which the floor was made was proportioned 4 parts Leicestershire granite, 1 part clean sand, and 1 part Portland cement of "Ferrocrete" brand, supplied by the Associated Portland Cement Manufacturers, Ltd.

Two floors identical in size and detail were constructed at the same time, having been completed during the last week in December, 1907. One of the floors was loaded privately by the company with a distributed load of about 85,000 lbs. on February 29th. This load was removed in the presence of the visitors last Wednesday, when it had therefore been on for over a month, and it was found that the deflection was almost entirely recovered, showing the great elasticity of the construction.

The test-load was applied by means of bricks. The deflection was read on a sliding-scale (as seen in the photograph, Fig. 3, which shows the full load on the floor), as each layer of bricks was put on. The load was first applied across the clear span on a strip only 7 ft. 6 ins. wide at the middle of the width, but eventually the load was carried over the whole area, *i.e.*, 24 ft. by 12 ft. The following table gives the ascertained deflection at each stage of the loading on the 7 ft. 6 in. strip:—

Total Distributed Load. lbs.	Centre Deflection at Middle ins.	Centre Deflection at Sides. ins.
8,000	$\frac{1}{8}$	$\frac{1}{8}$
16,000	$\frac{3}{16}$	$\frac{3}{16}$
24,000	$\frac{1}{4}$ bore	$\frac{1}{4}$ bore.
32.000	$\frac{5}{16}$	$\frac{5}{16}$
40,000	$\frac{7}{16}$	$\frac{13}{32}$
47 600	$\frac{9}{16}$	$\frac{17}{32}$
55,200	$\frac{11}{16}$	$\frac{5}{8}$
62,800	$\frac{7}{8}$	$\frac{3}{4}$
70,400	1	$\frac{7}{8}$
78.000	$1\frac{1}{8}$	1
85,600	$1\frac{5}{16}$	1
93,000	$1\frac{1}{2}$	$1\frac{5}{16}$

The loading was now carried out on the side portions not previously loaded until the 12 courses of bricks extended over the whole width. The total load was then 127,500 lbs.; the deflection in the middle being $2\frac{1}{4}$ ins., and the deflection at the sides 2 ins. Fig. 4 show this load. Bricks were now thrown loosely on the centre and middle until the whole quantity available, namely 72 tons, was on the floor, when the deflection had increased to $3\frac{5}{16}$ ins. in the middle and $2\frac{7}{8}$ ins. at the sides. In loading, precautions were taken to prevent an undue amount of arching.

The floor was calculated to sustain a superimposed load of $\frac{3}{4}$ cwt. per ft. super. The dead weight of the floor was 120 lbs. per ft. super. The factor of safety was to be 4.

We calculate that the distributed load of 72 tons caused a tensile stress in the steel of about 15 tons per sq. in., and a maximum compression in the concrete of 2,000 lbs. per sq. in. Including the dead weight of the floor, the total load sustained without breaking amounted to about 680 lbs. per ft. super., which may be considered very satisfactory.

The side beams were practically half beams, and consequently were reinforced proportionately greater than those in the middle. This probably accounts for the deflection being less at the sides than in the middle. Some diagonal cracks made themselves apparent near the supports, but the diagonal reinforcements did their duty. The cracks developed on the soffit of the beams were small and unimportant.

The United Kingdom Fireproofing Co., Ltd., of 47, Victoria Street, Westminster, deserve praise for undertaking so instructive a test on such a large scale. The result showed a thoroughly satisfactory and safe floor for the intended purpose.

We are advised by the Company that the floor broke at 12 o'clock on the night of the test. The view on the opposite page, taken the next morning, shows the result.

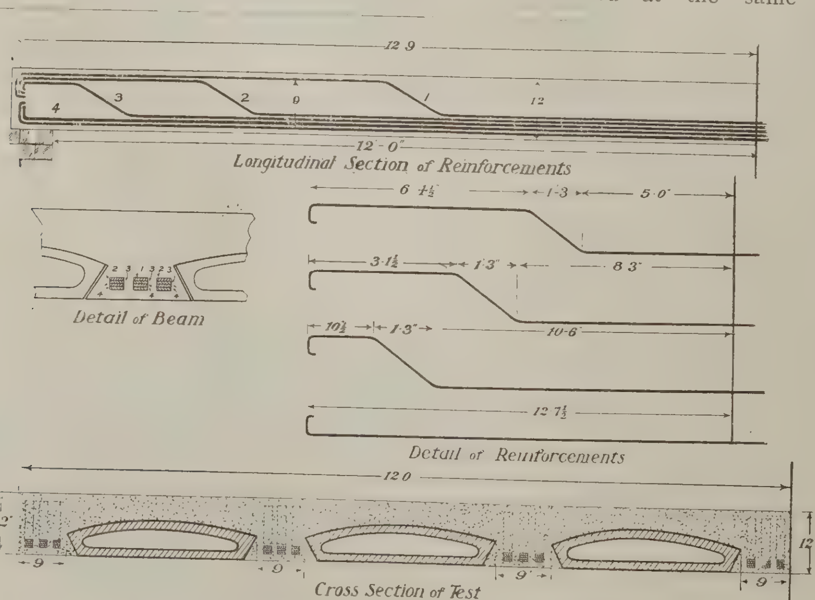


FIG. 1.—DETAILS OF FLOOR UNDER TEST.

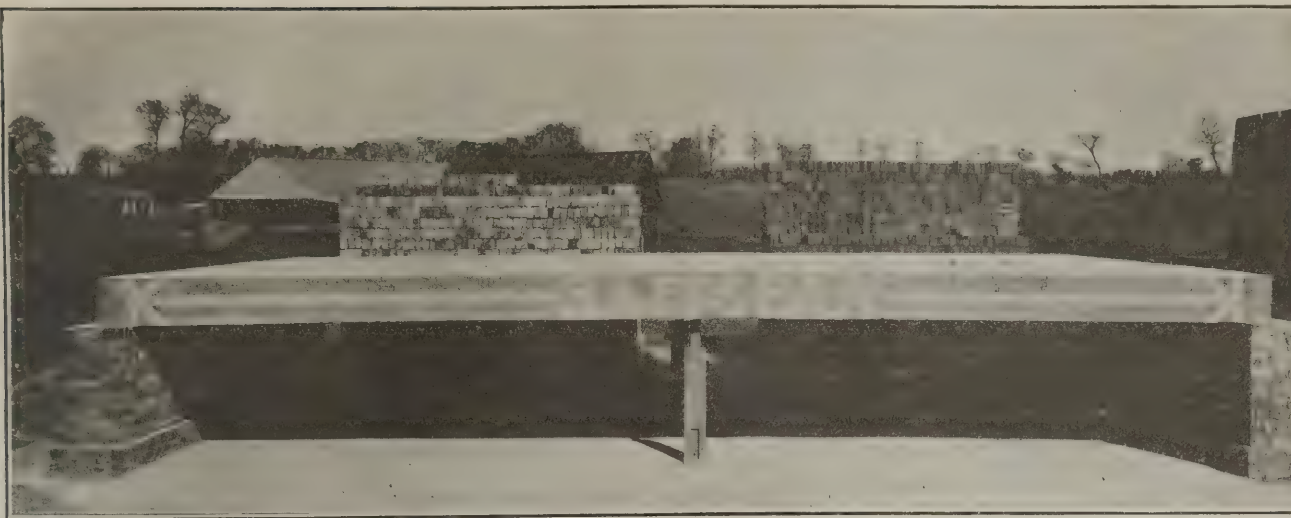


Fig. 2. Floor Ready for Load.

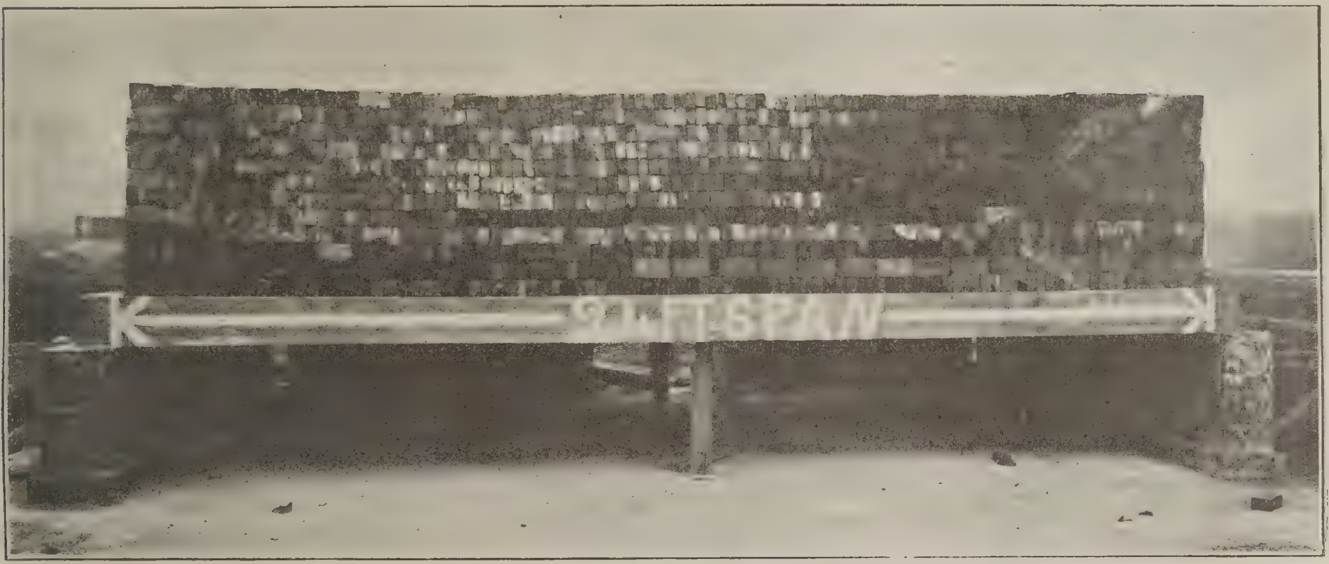


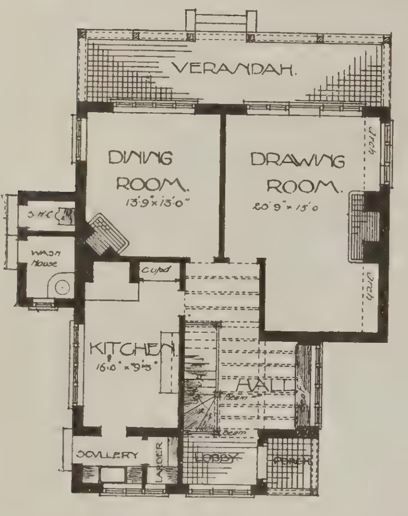
Fig. 3. Floor Loaded.

Fig. 4. Floor after Loading to Destruction.

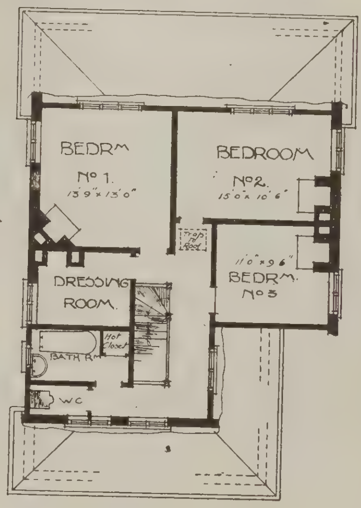
TEST ON A REINFORCED CONCRETE FLOOR OF 24-FT. SPAN AND 12-IN. DEPTH.

View from Road.

View from Garden.



• GROUND • FLOOR •



• FIRST • FLOOR •

SCALE 10 5 0 10 20 30 40 50 FEET.

COTTAGE ON PORTSDOWN HILL, HANTS. F. CORNELIUS-WHEELER, ARCHITECT.

The walls of this cottage are 11 ins., hollow, rough-cast. The roof is covered with hand-made tiles. The total cost was £494. Mr. F. Cornelius-Wheeler, of 5, Abchurch Yard, Cannon Street, London, E.C., was the architect, and Messrs. Perry and Sons of Southsea, were the builders.

SKYSCRAPER DETAIL.

A New Problem.

With the advent of the modern lofty office building the designer has found himself confronted with a really new problem in design—the problem of discovering the scale at which the decorative details of the building must be designed. The problem has been worked out many times and in various ways by different designers, but never with entire success; and this is not surprising, for the problem is almost unsolvable—for the simple reason that no one can determine

What is the Real View-point

for one of these skyscrapers. Was it designed for the pleasuring of the man passing in the street it fronts upon, or for him who sees it a few blocks away from his seat in an elevated railway car, or for him voyaging in a ferry-boat? The first can only see it enormously foreshortened, the second has but a fleeting glimpse of a section here and there seen down a side street, while the third can but see its upper part in mass and as a silhouette, to which the decorative detail lends no value whatsoever. For the man in the street, the detail, high up and seen only under sharp foreshortening, must be not only enlarged beyond ordinary dimensions, but also grotesquely distorted, so that it may have an approximately familiar air when seen from below, while for the benefit of those who see it from afar, still greater exaggeration in size and distortion in another direction is required. And who can say where the *juste milieu* lies?

Close Quarters with the Grotesque.

Surely those are most to be pitied whose unfortunate fate it is to have to stare out daily from their own lofty look-outs upon ungainly and sprawling decorative forms that the designer never conceived would ever be seen from such view-points. Think of the joy of gazing daily at a great terracotta festoon of cabbage roses, each of whose petals has the size and grace of the pad of a *Victoria regia*, or counting a row of dentils each as big as a dog-kennel, or studying the graces of an alleged human figure thrown into positions that even the Inquisitors' rack could not have accomplished! Surely the sensibilities of the occupants of neighbouring high buildings deserve to be kept in mind by those who design these skyscrapers and have to work out an acceptable scale for their decorative detail.

The Most Satisfactory Treatment.

Perhaps the treatment that has given most satisfaction occurs in those buildings where between the highly ornate upper storeys and the less elaborate lower storeys there is interposed a main body, or shaft, of plain walling practically wholly devoid of decorative treatment. In these cases any lack of accurate sequence in and proper gradation from the coarse exuberance of the detail in the upper storeys and the smaller-scaled and more refined detail of the lower storeys is unnoted, for the imagination readily perceives that, had it been thought desirable, the architect could have designed detail precisely suited to each successive height level, and connecting satisfactorily the scale used aloft with that used below. This plain middle body has a value in that it gives the beholder's imagination a field over which it can play and, in a manner, lends to the entire building something of the character and quality of a sketch, which is almost always more satisfying than a minutely finished picture.

The Cathedral Builders: A Comparison.

The cathedral-builders—almost the only ones who were vexed by the same sort of difficulty—had a much simpler problem than the designer of a skyscraper has. The cathedral, though, for the day, comparatively large, was actually quite modest in point of height (most of the English cathedrals fall within 100 ft., while another 100 ft. includes all but the loftiest spires), and so could easily be taken in at a glance from so near a point that the detail still counted; besides, the cathedral was designed to be seen from the ground and from the ground only, while no one can say from what point the skyscraper was intended to be seen—the designer himself the least of all, perhaps.

The Insistence of the Human Scale.

It is defensible to argue that because these buildings are huge, their decorative detail must be worked out on a Gargantuan scale. But St. Peter's is a standing warning to the designer who loses sight of the value of the human scale, and in these high buildings the human element insists on being recognised. Not only the mind knows that these buildings house thousands of men

and women daily, but the eye perceives that the human scale has been partly recognised and adopted at every level, for the office window, of uniform size from top to bottom, is a human unit of measure that can't escape recognition.

The problem is a difficult one and the writer does not pretend to have found a solution that satisfies even himself. Perhaps the new tower of the Metropolitan Insurance Building in Maddison Square, New York, may throw interesting light, for not only is it to be the highest structure in the city, but it is to be an adjunct of a building in which the human scale has been very successfully preserved. But in another way the lesson may be misleading, for, owing to its exceptionally favourable position at one side of a considerable open space, it can actually be seen in its entirety, as most skyscrapers cannot.—Extracts from an article in the "American Architect."

THE INSTITUTE MEMBERS' CLUB.

We have been asked by the Executive Committee of the Institute Members' Club to reserve space in our columns for the publication, from time to time, of notices of meetings, and other items of information relating to the business of the club, and in acceding to the request—by which we virtually become the official organ of the club—we think a word or two respecting its formation and objects will be of interest to our readers.

The club is the outcome of a conviction held by many members of the Institute that among the younger members especially there are many who are completely out of touch with those whose privilege it is to direct the policy of the Institute. Such being the case, the Club affords facilities for members of the Institute to discuss matters of professional interest in an informal and frank manner at its meetings, and when a decision has been reached the Club directs the attention of the Council of the Institute to such expression of opinion. By this means it is hoped to materially assist the Council in its labours, and at the same time to bring it into closer contact with an increasing proportion of members whose views on vital points would otherwise never reach them.

We publish herewith the Club's first annual report, from which it will be seen that very useful work has been done during the year:—

Report for year ending December 31st 1907.

Your Executive Committee has pleasure in reporting that at a provisional meeting held on February 12th, 1907, at 46, New Bond Street, W., it was decided to form an association limited to members of the R.I.B.A., which should meet at intervals to discuss matters relating to the profession, and follow such course of action as might be considered likely to assist the Council in taking a wider conception of its responsibilities.

An additional meeting was held on February 20th to decide upon various matters connected with the formation of such an Association, and, as a result, the Institute Members' Club was founded, with its objects as set out in the preceding paragraph.

Fifteen meetings were held in the smoking-room of the R.I.B.A. during 1907, and amongst matters discussed and taken in hand by the Club were the following:—

In connection with Mr. W. H. Wills' motion at the business meeting held on Monday, March 4, dealing with the question of official architecture, your Executive Committee circularised the members of the R.I.B.A. in order to discover their views on the subject.

In the matter of the L.C.C. County Hall Competition, your Executive, by means of letters to the professional journals, the public press, and individual members of the L.C.C., memorialised that body to reconsider the conditions governing the competition, but regrets that the efforts of the Club were unsuccessful, although they hold the opinion that a considerable amount of good was effected in that the question of the jury system for assessing competitions was incidentally brought prominently before the public mind, and as the establishment of this system is one of the aims which the Club has in view, it is felt that the result is not unsatisfactory.

Through the action of the club it was established that Associates have the right to vote upon matters connected with and arising out of the charter. This is a distinctly valuable discovery, and has created a precedent which will prove a lever of considerable power in future debates of the Institute.

Steps were taken to ensure the nomination and election of members of the Club upon the Council and committees of the R.I.B.A., with encouraging results.

The committee of the Competition Reform Society was approached with a view of handing over its duties to the Club, and the Secretaries of the two societies met to discuss the matter, but no communication has been received up to December 31st.

In connection with various objections raised against the election to the Institute of Fellows who have not qualified by examination, the question of opposition by the Club was considered, but in view of the supineness of members connected with local societies more intimately interested in the matter, it was decided that no action be taken, although the spirit of the Committee was, that several of the nominations were questionable in point of professional desirability.

A number of questions dealing with architectural education, the Further Strand Improvement, and other less controversial matters were considered, but owing to pressure of other business were held over, and will be discussed as soon as opportunity offers.

The question of increasing the Club membership by means of circularising the general body of members was considered, but unanimously vetoed. It was instead decided that only those members of the Institute who have shown by various means their sympathy and desire for progress should be invited to become members.

During the year a copy of rules and various notifications were sent to the members.

(Signed) GEORGE HUBBARD,
K. GAMMELL and
F. CHATTERTON, Hon. Secs.

Our Plate.

St. Philip's Church, Birmingham.

The church of St. Philip, at Birmingham, designed in 1710 by Thomas Archer (a pupil of Vanbrugh), is a really fine building, and undoubtedly the best-known and most successful example of the powers of its architect. Archer's other works, such as the church of St. John at Westminster (1721-28) and churches at Deptford and Umberslade, in Warwickshire, are of quite inferior type as compared with this.

SCALE OF FEET.
Ground Floor Plan.
ST. PHILIP'S CHURCH, BIRMINGHAM.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
May 1	ENLARGEMENT OF PRINCESS ALICE HOSPITAL, EASTBOURNE.—Limited to local architects. Premium £25. Particulars from J. H. Silkstone, 6, Bedfordwell Road, Eastbourne.
May 1	FARM BUILDINGS.—Premiums £50 £25, £15 and £10. Particulars from Thomas McRow, Secretary, R.A.S.E., 16, Bedford Square, W.C. Summary in BUILDERS' JOURNAL, March 25th.
May	DOOR AND WINDOW FITTINGS.—(Assessors, Mr. Henry T. Hare, F.R.I.B.A., and Mr. Leonard Stokes, F.R.I.B.A.). Premiums of 15, 5 and 3 guineas. Particulars from N. F. Ramsay & Co., 1, Victoria Street, Westminster.
May 14	SCHOOL AT KINGSDOWN, BRISTOL (to accommodate 500 children).—Limited to local architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May 15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May 20	SCHOOL AT BRIDLINGTON.—Limited to local Architects. No premium. Particulars from G. G. O. Sutcliffe, Quay Road, Bridlington.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
1909. Jan. 1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date; final competition to be limited to six competitors.
Date not yet fixed.	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall Eccles, Lancs.

SHEFFIELD SOCIETY OF ARCHITECTS AND SURVEYORS.—At the annual general meeting of this Society held last week, Councillor W. C. Fenton was elected president for the ensuing year.

MESSRS. J. L. HOWARD AND CO., of Charing Cross, announce that they will shortly be removing their works from Southwark to Taybridge Road, Battersea, where the works will be largely extended.

A VERY FINE BROCHURE has just been issued by Messrs. Richard Crittall and Co., of 197, Wardour Street, Oxford Street, W., showing some of the heating and ventilating contracts recently executed by them: these including the Ritz Hotel, the Waldorf Hotel, the Piccadilly Hotel; the Felix Hotel, Felixtowe: the Carlton Hotel, Johannesburg; Rushton Hall, near Kettering: the new buildings at Wellington College, Berks; Chelsea Baths, the Haymarket and Playhouse Theatres, etc. Many excellent photographs are reproduced in the brochure, which is the best of its class we have seen for a long time past.

THE NEW HEADQUARTERS OF THE Y.M.C.A. which are to replace Exeter Hall have been designed by Mr. Rowland Plumbe, F.R.I.B.A. On the ground floor will be two fine assembly halls; on the first floor a reception lounge, reading-room, and other rooms devoted to social purposes, while the upper floors will provide space for about 200 bedrooms for the use of young men just entering business life in London. The basement will afford space for a gymnasium, baths, etc.

RETAINING WALLS IN THEORY AND PRACTICE.

BY T. E. COLEMAN.

(Continued from page 214, No. 682.)

It is necessary to bear in mind that the foregoing remarks respecting the extreme limit of deviation, refer only to structures forming a solid square or rectangle on plan, such as ordinary retaining walls, buttresses, &c. The limiting position of the centre of pressure for any section, so that there shall be no tension on any part of a bed-joint, may be determined from Rankine's formula, viz. :—

$$\delta \quad \frac{I}{A\,y}$$

where

- δ = limit of deviation of centre of resistance from the centre of gravity of the figure under consideration.
- I = moment of inertia of the figure.
- A = area of the bed-joint of the figure.
- y = distance from the centre of gravity of the figure of the bed-joint to the edge furthest from the centre of resistance.

The limit of deviation for ordinary structural forms having "uncemented joints" is as follows :—

	Safe limits of centre of pressure.	
	Minimum distance from outer edge.	Limit of deviation at centre of bed-joint.
Solid square on plan (Fig. 41)...	$\frac{1}{3}$ t	Middle third
Solid rectangle on plan (Fig. 42)...	$\frac{1}{3}$ t	Middle third
Solid circle on plan (Fig. 43)...	$\frac{3}{8}$ t	Middle quarter
Solid ellipse on plan (Fig. 44)...	$\frac{3}{8}$ t	Middle quarter
Hollow square on plan, as for factory chimneys (Fig. 45)...	(approx.) $\frac{1}{6}$ t	Middle two-thirds
Circular ring on plan, as for factory chimneys (Fig. 46)	(approx.) $\frac{1}{4}$ t	Middle half

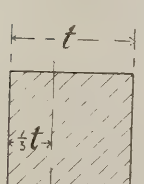


FIG. 41.

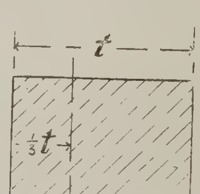


FIG. 42.

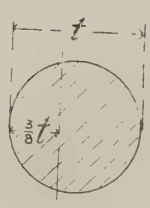


FIG. 43.

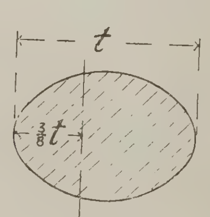


FIG. 44.

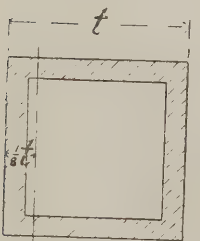


FIG. 45.

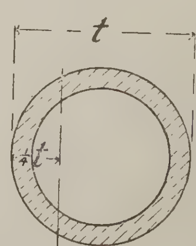


FIG 46.

With regard to the limiting position of the centre of pressure in any bed-joint for the last two-mentioned forms, it should be observed that its exact position depends upon the thickness of the sides as compared with the total dimensions of the figure, but for ordinary purposes the approximate value may be taken as given above.

Failure by Sliding.

When a block of stone or other solid rests upon another, as in Fig. 47, and is subject to an external force F, acting in a horizontal or oblique direction, a sliding stress is produced between the two bodies at A B. Let E H represent the force F in direction and magnitude, then by the parallelogram of forces, this single force may be resolved into two component forces K E and O E, which are respectively parallel and normal to the surface of contact A B, so that K E represents the amount of the force F producing a sliding stress between the two bodies, and O E the amount of the force F which is pressing the two bodies together. Any tendency to sliding is, however, resisted by the force of friction acting between the two solids at their surfaces of contact, so that if the frictional force is sufficiently great, no sliding motion will occur.

It has been ascertained that the force of friction between the surfaces of two bodies in contact is *directly proportional to the normal pressure acting upon them.* In other words, the force of friction is directly proportional to the total force with which any two solids are being pressed together, so that in Fig. 47 the frictional force between the two blocks at the bed-joint A B is proportional to the total normal pressure acting upon them. This consists of the weight (W) of the block A B C D acting vertically downwards, and normal to the horizontal bed-joint, together with the force O E, which represents the component normal pressure exerted by the force F upon the bed-joint.

Further, the force of friction varies according to the nature of the materials, and the condition of the surfaces in contact, and is quite independent of the area of the surfaces themselves. It is evident that the friction between two solids having polished surfaces of contact is less than if the surfaces are rough. As the force of friction between two surfaces is proportional to the *normal* pressure, and varies according to the nature of the surfaces themselves, the amount of friction may be conveniently calculated by the following equation :—

$$F = \mu N,$$

where

- F = force of friction,
- μ = nature of surfaces in contact = coefficient of friction,
- N = normal pressure.

A series of values for μ (called "coefficients of friction) for surfaces of different materials under various conditions has been determined from the results of actual experiments. The coefficient of friction is invariably expressed in terms of the maximum angle which the contact surfaces make with the horizontal, without actual sliding taking place between them. This angle is known as the "angle of repose" or "limiting angle of resistance" between the specific materials under consideration. In Fig. 48 the surface A B between the two bodies in contact, is shown as being inclined at such an angle that the block A B C D is just about to slide down the sloping surface. The angle B A E is therefore the angle of repose (ϕ) or limiting angle of resistance for the bodies in contact. Let G H represent the resultant weight or pressure (W) of the block A B C D, both in magnitude and direction, then K H represents the normal pressure (N) acting upon the inclined plane A B, whilst J H gives the corresponding value for the force tending to produce sliding. It is obvious that the force of friction (F) must be exactly equal and opposite to the component force J H, when sliding is about to take place. It can be shown that the angle K H G = B A E = ϕ, so that the force of friction (F) can be readily expressed in terms of the angle of repose ϕ, for the force of friction (F) = H J = K H tan ϕ = N tan ϕ.

As the force of friction (F) = μ N = N tan μ, therefore the coefficient of friction (μ) = tan ϕ. In other words, the value of the coefficient of friction (μ) is expressed in terms of the ratio existing between the height and base of the angle of repose.

The following table gives the angle of repose, the coefficient of friction ($\mu = \tan\phi$) together with the reciprocal to tan ϕ $\left(\frac{1}{\tan\phi}\right)$, and is based chiefly on the results of experiments made by General Morin.

Nature of Surfaces in contact.		Angle of Repose or Natural Slope. $= \phi$	Coefficient of friction $= u = \tan\phi$ = Ratio of height of slope to base.	Reciprocal to tan ϕ $= \frac{1}{\tan\phi}$ = Col. $\phi = \tan 90^\circ - \phi$ = Ratio of base of slope to height.
Masonry or brickwork laid dry	from	31°	·600	1·66
	to	35°	·700	1·43
Masonry or Brickwork newly laid, wet mortar		25°	·466	2·14
do. damp mortar		36°	·726	1.37
Masonry on dry clay		27°	·509	1·96
do. moist clay		18°	325	3·08
Wood on Stone		22°	·404	2·48
Iron on Stone	from	17°	·306	3·22
	to	35°	·700	1·43
Wood on Wood, laid dry	from	14°	·249	4·01
	to	26°	·488	2·05
Sand, fine dry		32°	·625	1·60
do. wet		26°	·488	2·05
Earth, ordinary ...	from	14°	·249	4·01
	to	45°	1·000	1·00
do. consolidated and dry...		45°	1·000	1·00
do. loamy	from	21°	·384	2·60
	to	37°	·754	1·33
do. very wet ...	from	14°	·249	4·01
	to	17°	·306	3·27
Clay, moist, recently excavated	from	15°	·268	3.78
	to	25°	·466	2·14
do. wet	from	10°	·176	5.67
	to	17°	·306	3·27
do- dry	from	22°	·404	2·48
	to	29°	·554	1·80
Gravel, compact ...	from	35°	·700	1·43
	to	43°	·932	1·07
do. with sand ...	from	26°	·487	2·05
	to	35°	·700	1·43
Shingle, loose	from	32°	·625	1·60
	to	38°	·781	1·28
Rubble stone		45°	1·000	1·00
Peat, wet		14°	·249	4.01
do. dry consolidated ...		45°	1·000	1·00
Mud, semi-liquid		5°	·087	11·43
Water		0°	Zero	Infinity

When sliding is about to take place at any bed-joint of a structure, it can be shown that the angle which the resultant (R) of all the forces acting upon the bed-joint makes with the normal to the joint is equal to the angle of repose. This may be illustrated, as in Fig. 49, where E H J K represents a diagram of the forces F and W acting upon the block A B C D, and E J the resultant force. When the block is on the point of sliding at the bed-joint A B, then the angle M S E made by the resultant (R) and the normal to the bed-joint is exactly equal to the angle of repose for the material.

To ensure simple "*stability of friction*" it is therefore necessary that the resultant pressure at each bed-joint shall not make

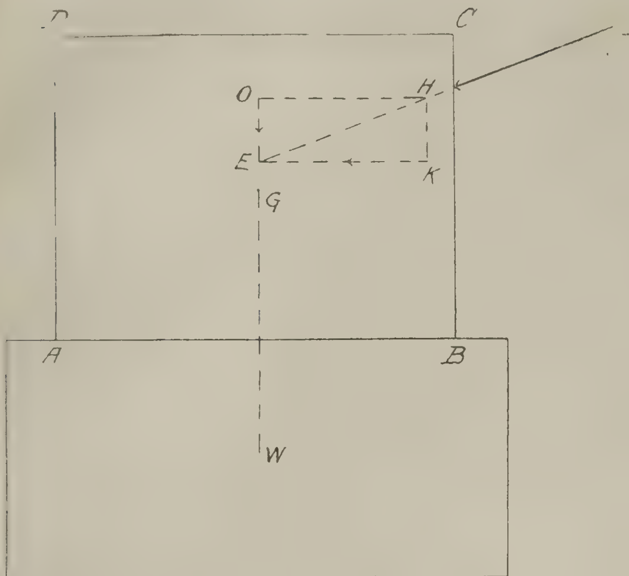


FIG. 47.

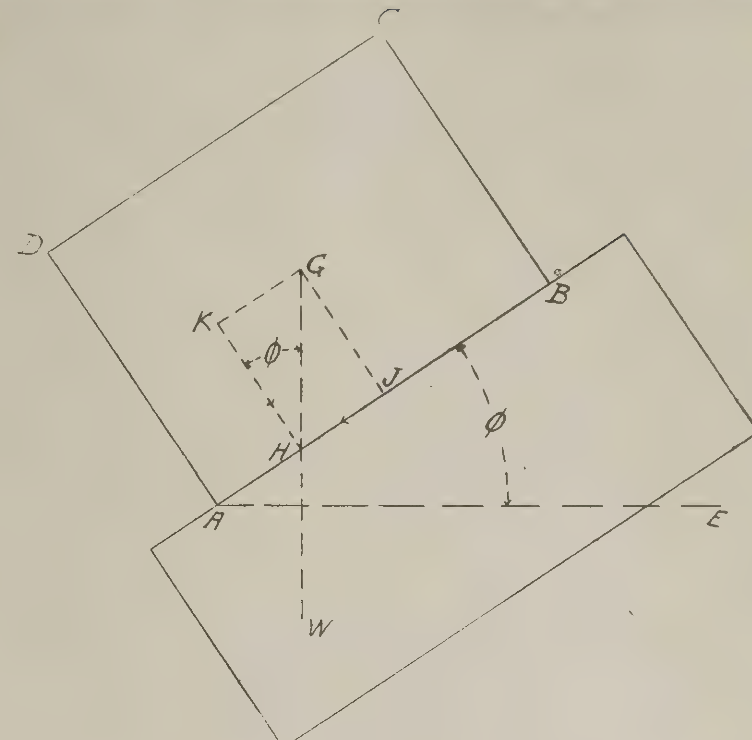


FIG. 48.

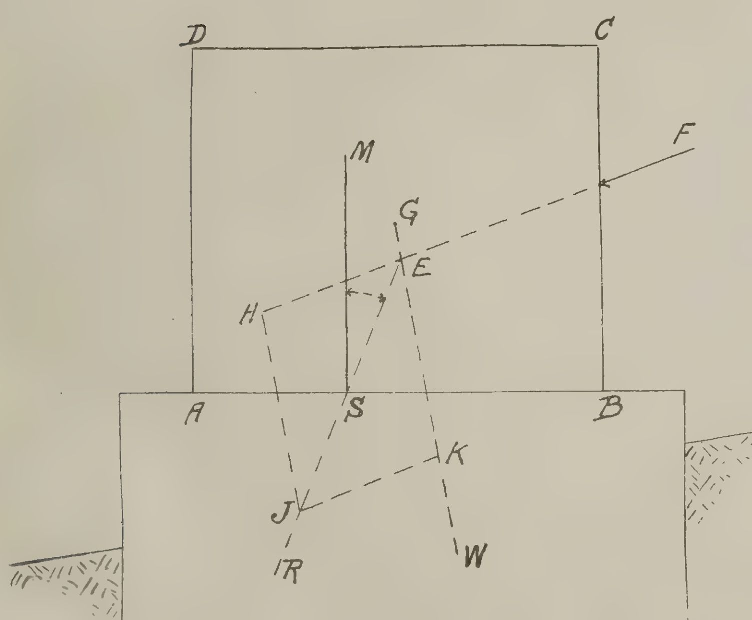


FIG. 50.

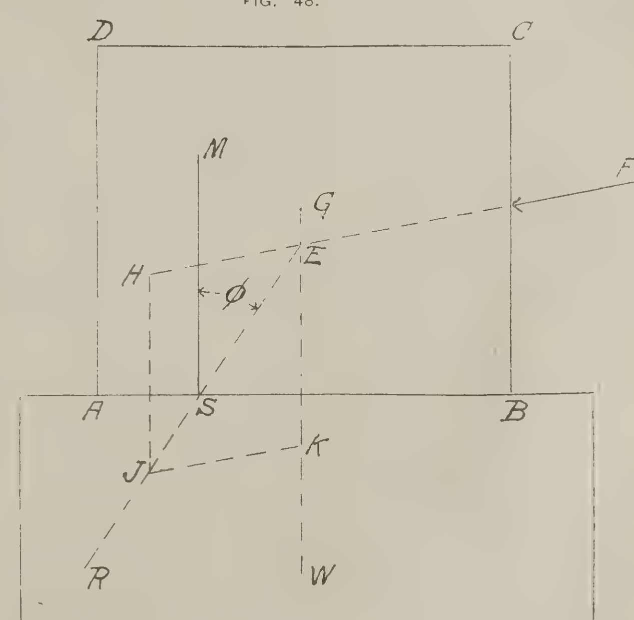


FIG. 49.

with the normal (or perpendicular to it) a greater angle than the angle of repose for the material. As, however, no bed-joint in any retaining wall should be subject to this extreme limit, it is necessary to provide some margin for safety. For ordinary purposes, it is usual to design the structure so that the angle between the resultant pressure and the normal at each bed-joint shall not exceed $\frac{4}{5}$ths the angle of repose, or, in other words, the angle shall not exceed $\cdot 8 \tan \phi$. Taking the angle of repose for new brickwork or masonry with damp mortar at 36°, then the maximum angle for stability of friction $= \cdot 8 \tan \phi = \cdot 8 \tan 36° = \cdot 8 \times \cdot 726 = \cdot 580 = \tan 30° = 30°$.

In the case of a retaining wall where stability of friction is not obtained at the bed-joints, but which fulfils all the other conditions of stability as regards resistance to overturning and crushing, the necessary stability of friction may be obtained by designing the wall with sloping bed-joints. Fig. 50 shows the block A B C D drawn to the same scale as in Fig. 49, but with a sloping bed-joint. The result obtained by this form of constructiou shows that the angle M S E is considerably less than the corresponding angle indicated in Fig. 49.

Theory of Earth Pressure.

In all investigations concerning the pressure or thrust of earth on walls, etc., it is usual to consider the stability of the earth particles as being entirely dependent on the frictional force existing between them, although a certain amount of adhesive force is also present. The intensity of adhesion occurring between the different particles of a mass of earth usually varies so considerably from time to time (according to the amount of moisture present, and other constantly changing influences) that no reliable or practical data can be obtained upon such an extremely variable factor. For this reason it is desirable that any adhesive force which may be present between the particles of earth should not be taken into consideration, but looked upon as providing some slight additional margin of safety as regards the general stability of the mass.

It has already been shown that the force of friction between any two bodies is directly proportional to the normal pressure, and varies according to the nature of the materials, so that

Force of friction $= \mu N = N \tan \phi = P \sin \phi$, where μ = coefficient of friction = tangent of angle of repose; N = the normal pressure; P = total pressure between the surfaces; and ϕ = angle of repose for the materials. The total pressure of the earth upon a retaining wall is therefore dependent to some extent on the natural slope of the soil.

What is known as the "wedge theory" of earth pressure is based chiefly on the researches of M. Prony, who ascertained that the *maximum* thrust of a bank of

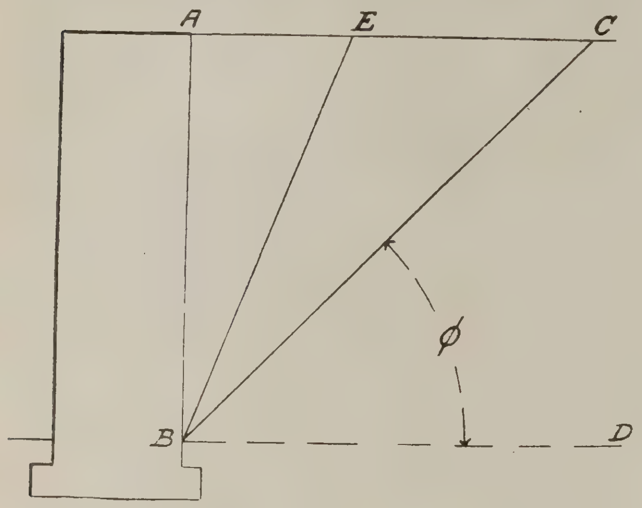


FIG. 51.

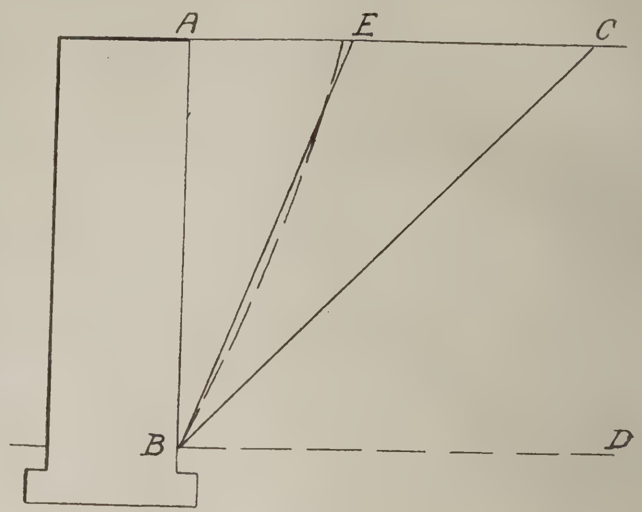


FIG. 52.

earth behind a retaining wall is reached when the plane of fracture of the sustained earth bisects the angle which the natural slope of the earth makes with the vertical. Fig. 51 is the section of a retaining wall, where the angle D B C represents the angle of repose, or natural slope of the earth embankment, and the line B E bisects the angle C B A formed between the natural slope and the vertical.

At one time it was considered that the plane of rupture for earth supported by a retaining wall might be assumed as coinciding with the natural slope of the earth, but it has now been established by numerous experiments that on the failure of a retaining wall by overturning a wedge-shaped mass of earth is at the same time detached, and moves forward along a line of disruption about midway between the angle formed by the natural slope and the vertical. The actual line of rupture usually forms a slight curve, as roughly indicated by the dotted line in Fig. 52, but its form and position is also to some extent modified by the adhesive power of the earth particles and other local causes. The nearest approximation which can be given for general application to retaining walls supporting a bank of earth with level top is obtained by considering the plane of rupture as bisecting the angle between the vertical and the angle of repose for the earth. In Fig. 51 the line B E indicates the plane of rupture.

The immediate disruptive effect upon a bank of earth, caused by the overturning of the retaining wall, does not therefore extend beyond the plane of rupture, and this detached mass of earth represents the amount of earth pressure directly borne by the wall. Portions of the standing earth are, however, detached from time to time, the action of the weather and other external influences gradually overcoming the adhesive force of the earth particles, so that the ultimate slope of the soil finally conforms to the angle of repose for that material.

To ascertain the effect produced by a bank of earth upon a retaining wall, it is necessary to determine the following particulars, viz. :—

1. The centre of pressure of the retained earth.

2. The magnitude of the total pressure produced by the bank of earth.

3. The direction of the pressure or thrust of the retained earth.

(To be continued.)

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
The querist's name and address must always be given, not necessarily for publication.

Rough-Cast.

MANCHESTER.—T. J.H. writes: "I have a job in hand where the exterior walls are to be rough-cast. Two chimney stacks have been done and I find that the finish is a most disagreeable colour—a kind of dirty yellowish brown, although ochre has been mixed with the finishing coat. I desire to get a warm cream colour. How can this result be obtained? The specification says: 'The walls to be rendered with Portland cement and sand (3 to 1) to an even consistency. The limestone chippings to be well washed and passed through a sieve of ¼ in., and mixed with hydraulic lime and water (stained to finish an approved cream tint) and quickly and evenly dashed on with a hollow trowel, and left with a uniform though rough surface.'"

The disagreeable colour of rough-cast can be rectified by the application of Hall's washable distemper (outside quality) of the desired tint. It is probable that the original failure is due to the influence of the cement or lime, as great variety of colour is often noticeable in different specimens, or even in different consignments from the same kiln. The use of chalk lime (with the admixture of a small quantity of Russian tallow to prevent rain streaking the work below) gives a good cream tint, but it is preferable to execute rough-cast entirely in cement, and colour it to the desired tint as first recommended.

Removing Varnish and Paint on Old Woodwork.

DORSET.—OLD SUBSCRIBER writes:—"We have an old room, lined with some good Jacobean oak panelling, which has been painted, grained and varnished all over. What is the best detergent for the removal of the varnish and paint, with the least possible injury to the woodwork?"

The entire removal of old paint and varnish is rather a tedious matter, and all the usual methods are practically certain to do more or less damage to the surface of the woodwork. One method is to apply to the surface a thin plaster of quicklime mixed with soda, which is washed off with water the following day, leaving the paint soft enough to be scraped off. If there is any carved enrichment it may be necessary to adopt further treatment of such uneven surfaces with a solvent wash of chloroform mixed with a small quantity of spirit ammonia. Probably, however, a better result can be obtained by the use of one of the recently introduced "paint removers."

Ordnance Survey Maps.

LONDON.—ENQUIRER writes: "How are the Ordnance Survey maps taken with regard to sloping land? Do they (when scaled, for instance) represent it on the slope or imaginary horizontal? How should auction sale plans be figured and scaled?"

Ordnance maps always scale horizontally—a moment's thought will show the impossibility of any other method. Auction sale plans should follow the same rule.

Varnish for Maps.

DUBLIN.—D. writes: "Some large maps, up to 9 ft. by 7 ft., are being made on thick 'Whatman' with broad washes of indelible waterproof inks of various colours. In some cases it was necessary to dilute the ink with water to modify the tone. It is now proposed to apply a transparent and protective finishing coat—a species of varnish. Can you recommend any finishing coat, if such be advisable over diluted ink?"

The maps may be varnished with special paper varnish, obtainable from any artists' colourman, or, if it is feared that the colours already laid may be disturbed in varnishing, with spirit varnish applied with a spray. If a gloss finish is not required, "Fixatif" sprayed over the drawings would probably meet the case.

Dry Rot in Floor Boarding.

LONDON.—H.A.W. writes: "When covering a first-floor room with tongued and grooved boarding, with a plaster ceiling in the usual way, is it neessary to provide air-bricks as ventilation and safeguard against dry rot? Would grooved and tongued boards be more conducive to dry rot than any other joint?"

Grooved and tongued flooring does of course render a floor practically air-tight, which is its chief advantage where (as on

a ground floor) a brisk air circulation is often moving beneath the floor. Its use presents less advantage on an upper floor, but the risk of dry rot in the circumstances described is very slight, and the provision of air-bricks between floor and ceiling is not to be recommended, as moisture is likely to blow through same, and cause damp spots on the ceiling.

Articles.

KENT.—F.D.P. writes: "I should be glad to know whether my articles are binding as to the accompanying clause.

Provided always, and it is hereby agreed and declared between the parties hereto, that on the expiration of the said term the said F. P. shall not, without the previous consent in writing of the said E. J. H., directly as principal or partner, carry on or be concerned with any person in carrying on the profession, business, or practice of an architect, surveyor, and land agent within the three towns of ——, ——, and ——, and that in the event of any breach of this clause the said F P. shall pay to the said E. J. H. the sum of one hundred pounds, which shall be recoverable by the said E. J. H. as and for liquidated damages, but this proviso shall extend only to such period as the said E. J. H. shall personally carry on the said business within the said town.

My father, F —— P.——, mentioned in the clause, having been dead for nineteen months, my opinion is that the clause is not now binding, as it only bound my father to pay the amount set forth and it does not make any provision on account of his death, whether I or my father's executors should have to pay the amount set forth."

I am of opinion that the articles are binding, both in law and in equity—the death of your father not affecting the position of the other party in the least. Whether the £100 would be taken as the measure of damages against yourself, I do not know, but it is clear to me that you can be prevented, by injunction if need be, from practising in the "three towns" so long as the gentleman mentioned also personally practises. F.S.I.

DUBLIN.—E.E.P. writes: "Is it necessary to have 'discharged' or any other word or words written on my articles, which have been completed to the principal's satisfaction? The articles were for a term of three years with a civil engineer, and a premium paid."

It is a matter of little importance what becomes of the articles after the term of pupilage has expired, but they may be endorsed by the master as suggested.

Cost of Secondary Schools.

ECONOMY writes: "I understand that secondary schools are being or have been built in the West Riding of Yorkshire, Dorset and Cornwall at a cost varying from £25 to £30 per head of the accommodation, and that a school has recently been opened at Poole, Dorset, at £24 per head. Can you say what price per foot cube these buildings worked out at? Failing this information, what is the lowest price per ft. cube that a secondary school building would cost, the whole internal and external treatment being kept as plain as possible?"

Any statement as to the price per head for which secondary schools have been erected, without details of the type of plan, sizes of classes, and general curriculum, can be of little value. It is obvious that a school, say, for 300, with classrooms to accommodate from 20 to 25, planned upon a corridor system, with an assembly hall (not a central hall), art room, gymnasium and properly equipped chemical and physical laboratories, and lecture room, etc., must cost considerably more per head than a school for the same number planned with a central hall and classrooms to accommodate from 25 to 30, with no gymnasium or art room, and probably a laboratory capable of serving both for chemistry and physics. It would also be difficult to state the lowest price per ft. cube for which a secondary school might be erected, as much would depend upon locality; 5d. would be a low price, and 6d. to 6½d. an average one. A school now being erected in the West Riding is costing 6½d. per ft. cube, and the winning design for the Bishop Auckland school, we believe, was priced at 7½d. per ft. cube.

Claim Under a Road Contract.

QUERIST writes: "The owner (O) of a building estate entered into a contract with a contractor (C) to lay out certain roads in accordance with plans, etc., prepared by an architect (A), the work to be completed by a certain date under a penalty of £1 a day. While the work was proceeding in accordance with the plans the owner said it was not as he desired, and blamed C. The architect at first admitted to C that his plan was wrong, but afterwards laid the sole blame on C, who thereupon instructed two architects to examine the work and the plans, and they both confirmed C in the view that the levels were quite wrong and that the plans could not be followed. O (backed up by A) still contended that C was wrong, and there was a deadlock. A claim of about £190 for extras was sent in, but for some time it was ignored and then A certified for about £30 only. This was declined, and proceedings were commenced, and after some trouble with A, the owner referred the question to another surveyor, though not a properly qualified architect, but the architect employed by C has convinced O and his representative that the contractor's claim that he had correctly made the road in the first instance according to the plan was right, and that the levels of the plan, as above mentioned, were all wrong, and consequently that the claim for the extras, with a few slight deductions, is correct. (1). Is the contract void, or voidable? (2). Is a penalty chargeable, especially in view of A's authority to leave works undone till a later period? (3). If a penalty is enforceable, should C be charged for Sundays? What is the custom?" (Contract sent.)

This appears to be a rather complicated case, with faults on all sides. Why did not the contractor proceed under the "disputes" clause of his contract, under which provision is made for arbitration? The architects and surveyors he has called in appear to me to possess no *locus standi* in the matter at all. If the surveyor mentioned in the contract was not acceptable to the contractor, he could have asked for the arbitrament of another. I am of opinion:—(1). That the contract is not necessarily void, nor is it voidable. (2). A very difficult question, and one upon which I can hardly hazard an opinion. I rather doubt whether a penalty can be enforced. (3). The amount of a penalty often depends upon the amount of damages sustained by the owner, and though in this case I believe that the sum recoverable is limited to the amount of the "ascertained damages" of £1 per day mentioned in the contract, the fact yet remains that an owner's damage or inconvenience goes on as well upon Sundays as on other days of the week, and I therefore think that Sundays should be included in the count. I advise the contractor to consult his solicitor before further proceeding, and, subject to what that gentleman may advise, I suggest that the contractor should even now ask for arbitration; and if that be refused, he should await events. An owner cannot shelter himself behind his architect's mistakes—he himself appointed him and must stand by him. On the other hand, impracticable plans do not absolve a contractor (*Thorn v. Mayor of London*). F.S.I.

Which are the "Habitable" Rooms of a House?

YORKSHIRE writes: "I have recently erected two semi-detached villas, costing £550 each. Plans were approved by the local authority. During the course of erection it was decided to add an attic to one of the houses. I agreed with the surveyor to send in an amended plan for this when the buildings were finished. The plan has been sent in and is disapproved by the local council, on the grounds that the attic does not conform with a by-law which states that 'window area of all habitable rooms to be equal to one-tenth floor area.' I would point out that although the area of the window is not quite equal to this, the room is particularly well lighted (window 4 ft. by 3 ft.). Which are the habitable rooms of a house? Are the attic, the box-room, the cellar and the pantry included under this head? The attic is only intended for storage. I am threatened with prosecution by the local authority."

The arrangement with the council's surveyor that work might proceed, provided that plans were subsequently submitted, naturally enough was made by him under the assumption that the plans would be in accordance with the by-laws. The attic is undoubtedly a "habitable" room because it is one "capable of habitation," whether it is now intended to be so used or not; and in the same way a box-room might certainly be held to come under the same by-law—but in every case a reasonable amount of discrimination must be used. I certainly do not advise you to contest an action in this respect, as you are practically certain to lose the case and to have a good deal of legal expense about it. F.S.I.

A Heating Contract.

LEICESTER.—A.B. writes: "It is proposed to put in a new heating apparatus and to erect a new heating chamber at a church. Tenders have been invited first for the heating apparatus, and the accepted one has been included as a lump sum in the general quantities for the heating chamber. Is it necessary to have a separate agreement with the heating engineer for the due fulfilment of his work, or is the general contractor responsible on signing the agreement?"

The information you give is insufficient, but from it I conclude that the man who has signed his name to the contract is responsible for all the work. The only additional contract that can reasonably be asked for is one with the lump-sum-for-all-the-work contractor approving of his sub-letting a portion of the work. In this second contract the name of the sub-contractor should not be mentioned, and the chief contractor should be held responsible for all the sublet work. Any dispute as to who is to bear loss caused by any of the sublet work not being equal to requirements is to lie between the chief and the sub-contractor. From your statement it is plain that a bargain has been struck between buyer and seller, and it should be held to.

INGENIOR.

Notes and News.

A Chair of Architecture at Bristol University is proposed by the Bristol Society of Architects.

* * *

The Rhodes Memorial.—On the steps leading up to the Rhodes Memorial on the Matoppos, Rhodesia, eight colossal lions are to be placed. Mr. J. M. Swan, R.A., has been commissioned to execute these.

* * *

An Addition to the Hackney Infirmary—block B—is to be proceeded with at once. Messrs. Kilby and Gayford, Ltd., have secured the general contract. The building is to be fireproofed throughout on the Mark Fawcett system.

* * *

400 Applicants for a Buildings Inspectorship.—For the post of buildings inspectorship to the Nelson Town Council, carrying a salary of £2 a week, 400 applications were received from all parts of England and Wales, only 24 of them being local. The appointment, however, is given to a local man.

* * *

Change of Address.—Owing to the expiration of the lease, Mr. R. Stephen Ayling, F.R.I.B.A., has removed his offices from 23, Old Queen Street to 8, Dartmouth Street, Queen Anne's Gate, Westminster. The telephone number (5020 Westminster) remains unaltered.

* * *

The New Hippodrome, Nottingham, is about to be commenced. Messrs. Parkinson and Sons, of Blackpool, are the contractors, and Mr. Bertie Crewe, of London, is the architect. The seating capacity of the house, which will have two tiers, will be upwards of 2,600.

* * *

New Schools are in course of erection at Woodbridge, Suffolk, from designs by Mr. John Shewell Corder, architect, of Ipswich. The builders are Messrs. Partington. The constructional steelwork is being executed by Messrs. Mark Fawcett and Co., of Westminster.

* * *

Salt-Water Swimming Baths have been provided by the Wallasey Urban District Council at Seacombe; they were formally opened last week. The first-class bath measures 75ft. by 30ft., and the second-class bath 75ft. by 27ft. The total cost (including site) has been about £20,000.

* * *

Architecture at the Salon.—The jury on architecture for this year's Salon is constituted as follows:—President, M. Daumet; vice-presidents, MM. Pascal and Girault; secretaries, MM. Guilbert and Hannotin d'Espouy, Eustache, Ch. Gautier, J. Gaudet, Lambert, Mayeux, Roussi, and Blavette.

* * *

A Pocket-Book on Reinforced Concrete has been compiled by Mr. Charles F. Marsh and Mr. William Dunn, F.R.I.B.A., authors of a recognised standard work on the subject, and will be published by Messrs. Constable. The title is "A Manual of Reinforced Concrete and Concrete Block Construction." The material in the manual will be found invaluable to architects, civil engineers, draughtsmen, and foremen of works, and to all who require knowledge of reinforced concrete structures. It gives, in concise and handy form, consistent with a clear presentation of the subject, the methods employed for the solution of everyday problems, with the information most frequently wanted in common practice. The tables and diagrams are designed to save considerable trouble in necessary calculations.

* * *

Tendering Extraordinary.—The following advertisement appeared in the Birmingham "Express and Star" for April 4th:—"Tenders are invited for the erection of a w.c., laying of drain, etc., at the Working Men's Club, Patshull Road, Albrighton. All those who desire to tender will attend at the Club on Wednesday, the 8th, at 4 o'clock. It will be explained to them."

* * *

The New German Sailors' Home in West India Dock Road, Limehouse, which has been provided by Baron Schroder, was formally opened on Wednesday last by Princess Christian of Schleswig-Holstein. The architect of the building was Mr. George Waymouth, F.R.I.B.A. The builders were Messrs. Dove Brothers. The building provides residential accommodation for 50 sailors, and has cost about £12,000.

* * *

School Architect for Monmouthshire.—At a meeting of the Monmouthshire Education Committee held on Wednesday last, Mr. John Bain, F.R.I.B.A., of Newport, was appointed chief architect for schools in the county, at a salary of £350, rising to £400; and Mr. J. A. Pryer, of Nottingham, was appointed assistant architect, at a salary of £140, rising to £200 per annum.

* * *

Derby Architectural Society.—The architects practising in Derby have formed an architectural society. At a meeting held at the Town Hall recently, rules and regulations were adopted, and the first officers of the society were appointed as follows: President, A. Macpherson; vice-president, A. Eaton; council, P. H. Currey, F.R.I.B.A., T. A. Fuller, F.S.I., L. Goldie, W. Swindell, T. H. Thorpe, F.R.I.B.A.; hon. secretary, G. Cash.

* * *

The New Offices of the Hamburg-Amerika Line at 15 and 16, Cockspur Street, London, S.W., are now practically completed. Mr. Arthur T. Bolton, in conjunction with Messrs. Stock, Page and Stock, has designed the building, which has been erected by the Waring White Building Co., Ltd.; for the woodwork throughout the building Messrs. Waring and Gillow are responsible.

* * *

Society of Ordained Surveyors.—The tenth annual general meeting of this Society was held in Edinburgh on Friday last. The report of the General Examining Board for the past session was presented. This stated that the adjustments of the draft modes of measurement for minor trades was nearly completed, and would shortly be submitted to the members for approval; and that the "Table of Fees" had now been completed, printed and issued to the members for their private use.

* * *

Coventry Municipal Buildings Scheme.—The Coventry City Council received last week the report from a deputation which waited on the President of the Local Government Board with respect to a scheme for new municipal buildings, including shops on the ground floor. Mr. Burns condemned the scheme as unworthy of the city, and advised the council to formulate one that would fulfil all requirements, and at the same time be in harmony with the adjoining historic buildings. The council decided to discuss the matter at their next meeting.

* * *

R.I.B.A. Prizes and Studentships, 1909.—The pamphlet giving full particulars of the 1909 prizes and studentships of the Royal Institute of British Architects will shortly be issued. The subject for the Soane Medallion is "A Casino on the Borders of a Lake"; for the Tite Prize, "A design for a Covered Arcade of Shops, 200 ft., long, connecting two parallel streets"; for the Grissell, "A Landing Stage forming the principal approach to a Royal Palace from a lake"; and for the Essay Medal, "The Influence on Architecture of Modern Methods of Construction."

* * *

The Monograph on Crosby Hall which the Committee for the Survey of Memorials of Greater London have been preparing for some time past will be issued on April 30th next by the Committee, through Mr. B. T. Batsford. It will form an exhaustive history of the building and will be illustrated by reproductions of rare engravings, recent photographs, and a fine series of drawings to scale, the whole presenting a complete and authentic record of the building. Mr. Philip Norman, F.S.A., and Mr. W. D. Caröe, F.S.A., are responsible for the letterpress.

* * *

Mr. Jos. Price, A.M.I.C.E., having completed a series of engagements extending over thirteen years as engineering manager to Messrs. Le Grand and Sutcliff, water-supply engineers, of Bunhill Row, London, is relinquishing the more active duties of the position, though still continuing to act as the firm's consulting engineer, and has opened an office at Queen Anne's Chambers, Westminster, where he will practise as an engineering expert, more particularly in the two branches which he has made his special study, namely, water-supply and refrigeration.

* * *

International Testing Association.—A meeting of members of this Association resident in Great Britain was held recently at the offices of the Iron and Steel Institute. English members were urged to submit papers to the congress which is to be held next year in Copenhagen. For the committees reporting at the Copenhagen Congress the English representatives appointed are—(1) International specifications for testing iron and steel, Mr. F. W. Harbord; (2) Specifications for copper, Dr. R. T. Glazebrook and Mr. F. Tomlinson; (3) Specifications for oil, Dr. R. T. Glazebrook; (4) Reinforced concrete, Mr. Edwin O. Sachs and Mr. Max Clarke.

* * *

L.C.C. Trade Scholarships. — The London County Council has recently been devoting considerable attention to the establishment of trade scholarships for boys, such scholarships being intended to give boys who are about the age of 13 or 14 the opportunity of going through courses of technical instruction at polytechnics and technical institutes, with a view to qualifying themselves for some skilled occupation. Boys who wish to enter the building trades may compete for the scholarships at the Council's building trade schools at Brixton or the new Beaufoy Institute at Kennington (in June and

July next (twenty scholarships will be awarded at each of these schools); while boys who prefer the woodwork industries may try for the scholarships at the Shoreditch Technical Institute or at the School of Art Woodcarving. Other trades are also provided for at the Central School of Arts and Crafts. Boys who desire to become engineers may compete for scholarships at the technical institutes at Paddington and Poplar, and at the Borough Polytechnic. The above scholarships carry with them free instruction at the technical school, together with maintenance grants of £10 for the first year and £15 for the second or succeeding years. They are confined to boys who reside within the area of the County of London. The examinations for the scholarships will be held, at a centre to be announced later, on June 2nd next. Applications to sit at these examinations must be made by April 25th. Further information can be obtained from the executive officer, L.C.C. Education Department, Victoria Embankment.

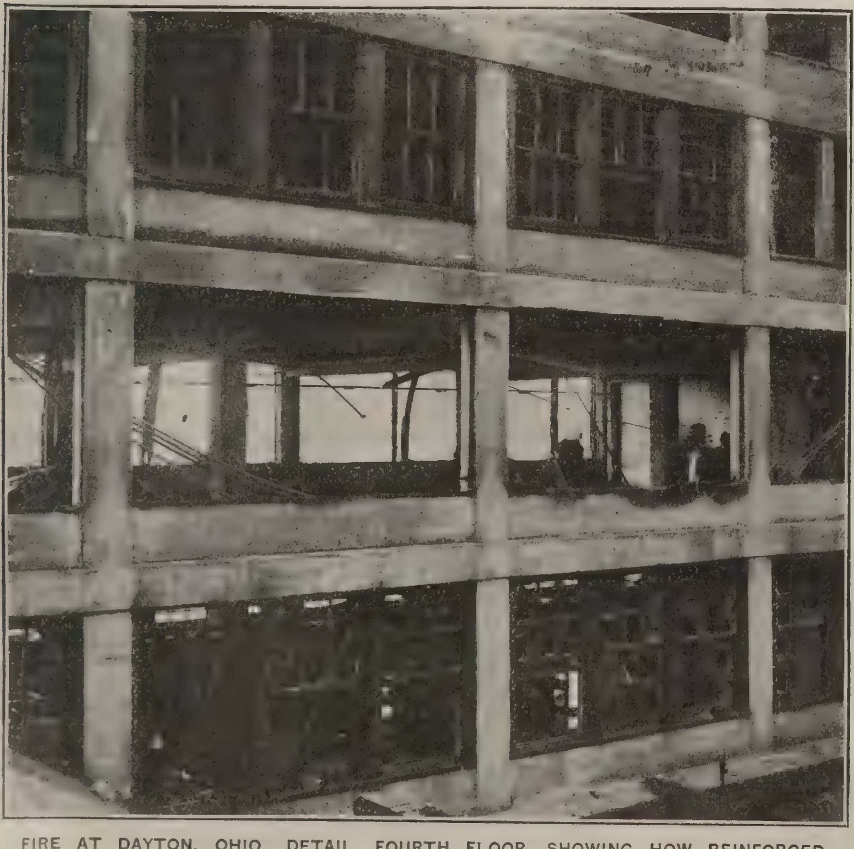
FIRE AT DAYTON, OHIO.
Brick Building on Left, Reinforced Concrete Building on Right.

THE FIRE-RESISTANCE OF REINFORCED CONCRETE.

A Striking Example.

The two photographs reproduced on this page afford a striking example of the value of reinforced concrete as a fire-resistant. The example happens to be an American one, but is, of course, equally applicable to work here. The fire occurred on February 20th last on the fourth floor of a six-storey motor-car factory building constructed entirely of reinforced concrete on the Kahn system, and though the contents of this floor and the woodwork of the windows, etc., were burnt out, the structure itself was practically uninjured.

A comparison between the reinforced concrete building on the right and the brick-built mill on the left is of interest, and it should be mentioned in this connection that, whereas in the mill there was a sprinkler system below the wood floors, in the reinforced concrete factory the sprinkler system had not been completed, and, consequently, was not working. Nevertheless, the two upper storeys and the roof of the mill were completely destroyed, while only the woodwork and the contents of the fourth floor of the factory were consumed. The fire broke out in the factory building, and had the fire doors between this building and the adjoining mill been in position, there is every likelihood that the fire would have burned itself out on the fourth floor of the factory without doing any material damage to the mill.



FIRE AT DAYTON, OHIO DETAIL, FOURTH FLOOR, SHOWING HOW REINFORCED CONCRETE STOOD.

On a careful examination of the concrete work, the only damage that could be discovered was that some of the columns and the edges of beams where the fire was hottest had become vitiated for a certain depth, and could be knocked off with a hammer; but there was no evidence of any deflection or cracking of any of the beams and girders, and the steel was quite unaffected.

One point brought out by this fire was the advantage of rigidly-attached diagonals in the reinforcing steel. The fire having penetrated and weakened the lower inch of concrete, would have seriously injured the strength of the structure had there not been a positive connection between the reinforcing steel and the upper masses of the concrete. It is suggested that if adhesion on the lower bar alone were depended upon, and the lower inch of concrete destroyed, the strength of the structure would be substantially lessened.

Mr. Frank B. Ramby, chief of the Fire Department at Dayton, after pointing out, in a letter addressed to the Trussed Concrete Steel Co., how well the reinforced concrete building withstood the fire, makes the following observations:—

"(1) The reinforcing steel should be covered with at least 2ins. of concrete, because the fire penetrated the lower inch of concrete, and had it not been for the rigidly-attached diagonals would have injured the strength of the structure.

"(2) The finished cement surface should be put on when the floor is being laid, thereby forming a solid mass, because the finished surface was destroyed wherever the heat was intense; the slab underneath being uninjured.

"(3) As we were hampered greatly in handling our ladders, and several of our firemen had a very narrow escape from being injured, or possibly killed, by falling sashweights, and we were compelled to force into the building all window frames that had not already fallen before we could use our ladders to any advantage, I would suggest that in the construction of a building an iron pipe should be embedded in the concrete for the weights to fall into, in case the window frames are destroyed by fire. If this plan were adopted in the construction of a building, it would enable the firemen to reach the fire without endangering their lives, and would assist in greatly reducing the fire loss."

(Tenders continued on page viii.)

London, S.W. — For the repainting of Westminster Bridge, for the London County Council. Mr. Maurice Fitzmaurice, Chief Engineer :—

Vigor and Co., Poplar ...	£2,876 0 0
W. Dudley, New Southgate ...	2,736 16 9
E. Proctor and Sons, Plumstead	2,389 8 1
Woollaston Bros., South Hackney	2,206 0 0
W. G. Beaumont and Sons, Bromley-by-Bow*	1,424 17 7

Chief Engineer's estimate, £3,160.
*Recommended for acceptance.

Luton.—For the erection of Wellington Street Baptist Schools. Messrs. George Baines and Son, architects, 5, Clements' Inn, Strand, London, W.C. :—

A. Attwood	£7,013 0 0
W. Lawrence and Son ...	6,606 0 0
Mattock and Parsons ...	6,511 0 0
Battley, Sons and Holness ...	6,376 0 0
W. G. Dunham	6,298 11 9
Miskin and Son	6,254 0 0
T. and E. Neville*	6,157 16 1

*Preliminarily accepted, with certain modifications.

Reading.—For the manufacture, supply, and the erection of steelwork, construction of concrete retaining walls, paving, metalling, and other works in connection with the covering of St. Giles's mill stream and the improvement of Mill Lane, Reading, for the Corporation. Mr. John Bowen, A.M.I.C.E., borough engineer and surveyor :—

T. Free and Sons, Maidenhead	£9,215 16 1
H. W. Godwin, Reading ...	8,465 0 0
Pethick Bros., Westminster ...	8,311 0 0
D. Somerville and Co., London, S.W.	7,950 0 0
T. W. Pedrette, Enfield, N. ...	7,814 8 4
H. Lovatt, Ltd., London ...	7,691 5 2
G. Bell and Sons, Tottenham...	7,280 19 0
Drew, Bear, Perks and Co. Battersea	7,279 16 7
T. Waston, jun., Southall ...	6,963 17 0
A. Fasey and Son, Leytonstone	6,805 5 0
E. C. and J. Keay, Birmingham	6,712 0 0
A. Findlay and Co., Motherwell	6,688 17 9
J. Ellis, Reading	6,677 1 6
McC. E. Fitt, Reading	6,561 0 0
A. Thorne and Sons, Westminster	6,508 19 9
A. F. Catley, London, W.C. ...	6,482 0 0
Langley and Johnson, Slough...	6,387 15 11
W. Pattinson and Sons, Westminster	6,150 0 0
C. Ford, Willesden Junction ...	6,048 0 0
A. Jackaman and Son,* Slough	5,956 0 0

*Accepted.

Redditch.—For the construction of liquefying tanks with screening and grit chambers, for the U.D.C., at their existing outfall works (separate tenders); also for the construction of 440 yds. of 9in. pipe sewer with man-holes in the Birmingham Road. Mr. Arthur J. Dickinson, engineer and surveyor :—

Curral, Lewis, and Martin, Birmingham	£2,682
H. Cooper, Sparkbrook, Birmingham	2,650
Sutherland and Thorpe, Harborne, Birmingham	2,621
J. Shrimpton, Redditch	2,600
J. H. Smedley, Leicester	2,479
G. P. Trentham, Handsworth, Birmingham	2,403
J. and A. Brazier, Bromsgrove ...	2,370
G. Trentham, Birmingham	2,289
T. Vale and Sons,* Stourport ...	2,210
Tilt Bros., Bromsgrove	2,197
J. A. Meridith, Cradley...	2,193

Sewage disposal works only.

G. Huins and Son, Redditch ...	2,136
H. Holloway, Redditch	2,135

*Accepted.

Scarborough.—For the erection of a new post office at Scarborough, for the Commissioners of H.M. Works and Public Buildings :—

		Credit.
D. Gill and Son ..	£14,557 0 0	£50 0 0
W. Wallis	14,500 0 0	10 0 0
A. Moore*	14,055 0 0	72 10 0

*Accepted.

St. Albans.—For the construction of four storm-water filter-beds at the sewage purification works, Park Street, near St. Albans, for the Corporation. Mr. H. Howard Humphreys, consulting engineer, 28, Victoria Street, Westminster :—

Pethick Bros.	£2,484 0 0
S. G. Smith, Spencer House ...	2,464 6 4
R. C. Brebner and Co., Edinburgh	2,176 4 0
H. Williams, St. Albans... ...	1,987 17 10
W. Muirhead and Co.	1,968 8 5
A. T. Catley	1,815 0 0
T. E. Pedrette, Bush Hill Park	1,718 6 11
C. Ford, Willesden Junction ...	1,677 0 0
Wort and Way, Salisbury ...	1,571 13 0
G. Powdrill, Luton...	1,501 0 0
T. Watson, jun., Southall ...	1,438 17 0
Wilson, Border and Co., Romford	1,382 15 10
D. S. Jackson, Barking	1,379 2 0
G. Bell and Sons,* Tottenham...	1,365 12 0

Rest of London.
*Accepted.

Saltley (near Birmingham).—For the erection of a pumping station, 120ft. in length, for the Birmingham Tame and Rea District Drainage Board. Mr. John D. Watson, M.I.C.E., engineer, Tyburn, near Birmingham :—

H. Crump	£3,777
G. Webb and Son	3,527
I. Langley, Tyburn	3,510
Lee and Son, Aston Manor ...	3,487
W. Bishop	3,397
W. Payne	3,360
Harris and Son, Halesowen ...	3,325
Lowe and Sons, Burton-on-Trent	3,313
T. Johnson	3,297
Currall, Lewis and Martin ...	3,250
W. H. James, Sutton Coldfield	3,248
Pattinson and Sons, London ...	3,179
Whitehouse and Sons	3,141
A. J. Turton	3,135
H. Lovatt, Wolverhampton ...	3,067
C. W. Horton, Brierley Hill ...	2,965
Dallow and Sons, Blackheath ...	2,950

*Accepted.
Rest of Birmingham.

Wanstead (Essex).—For the construction of six contact beds at their sewage farm, for the U.D.C. Mr. C. H. Bressey, surveyor :—

O. R. Anstead, East Ham ...	£3,010 0 0
Jarman and Daws, Richmond ...	2,132 19 6
W. Griffiths and Co., London, E.C.	1,886 19 5
O. T. Gibbons, Leytonstone ...	1,825 0 0
C. Ford, Willesden Junction ...	1,805 3 2
T. Adams, Wood Green ...	1,737 7 5
E. Parry and Co., Putney ...	1,737 0 3
Parsons and Parsons, Ilford ...	1,737 0 3
W. and C. French, Buckhurst Hill	1,689 9 4
W. Manders, Leyton	1,663 4 10
G. Bell, Tottenham	1,640 17 11
D. T. Jackson, Barking	1,542 2 11
Wilson, Border and Co., Romford	1,918 9 8

* Surveyor's estimate, £1,940.

Bankruptcies.

During the week ended April 10th twenty seven failures in the building and timber trades of England and Wales were gazetted.

E. A. Pratt, builder, Kennington, London, S.E.
T. Dawson, builder, Bolton. R.O., April 3.
M. F. Rowe, builders' merchant, Wood Green. R.O., April 3.
T. F. Angus, joiner and builder, Blackpool. R.O., April 2.
G. Tyson, builder, Bubwith, Selby. Gross liabilities, £1,221; assets, nil.
J. Norris, builder, Chiswick. R.O., April 3. First Meeting, 14, Bedford Row, W.C., April 16, at 12.
G. S. J. Muirhead, builder and timber merchant, Newport (Salop). Liabilities, £3,761; deficiency, £3,629.
M. Langler, builder, Ipplepen. First meeting, O.R.'s, Exeter, April 14, at 12. P.E., The Castle, Exeter, same day, at 2.30.
C. Beach, builder, Hounslow. First meeting, 14, Bedford Row, W.C., April 15, at 12. P.E., C.C., Brentford, April 14, at 11.
W. S. Tippett, builder, Newquay. Gross liabilities, £3,673; £1,505 expected to rank for dividend; assets, £825; deficiency, £679.
R. Fleming, builder, Aldgate and Ilford. R.O., April 3. First meeting, Bankruptcy Court, April 16, at 12. P.E., same, May 14, at 11.
H. S. Chaplin, timber merchant, Newark. First meeting, O.R.'s, Nottingham, April 15, at 11. P.E., C.C., Nottingham, May 8, at 10.30.
A. J. H. Hayes, builder, Hawkley. R.O., March 31. First meeting, O.R.'s, Portsmouth, April 15, at 12. P.E., C.C., Portsmouth April 27, at 11.
G. W. Pearce, builder, Streatham. R.O., April 2. First meeting, 132, York Road, S.E., April 16, at 11.30. P.E., C.C., Wandsworth, May 14, at 12.
J. Wilkins, stonemason, Loughborough. R.O., April 2. First meeting, O.R.'s, Leicester, April 15, at 12. P.E., The Castle, Leicester, May 15, at 10.
E. R. C. Kerrison, builder, Walsham-le-Willows. R.O., April 1. First meeting, O.R.'s, Ipswich, April 21, at 12.15. P.E., Guildhall, Bury St. Edmunds, May 1, at 11.45.
G. H. Crook, builder and contractor, Chorlton-on-Medlock, and Greenhays, Manchester. First meeting, O.R.'s, Manchester, April 13, at 3. P.E. C.C., Manchester, May 29, at 10.

New Company.

The Wingate Concrete Machine Co., Ltd., manufacturers of concrete building blocks, tiles, etc. Capital: £3,500. (The subscribers reside in West Hartlepool, Newcastle, Sunderland, and Leeds.)

New London Buildings.

The following applications came before the London County Council at their meeting yesterday :—

Porches to six houses on the western side of Muirkirk Road, Catford, on the application of C. Nicholas, on behalf of W. Rolfe (*consent*).

Erection of four houses with projecting pent roofs eastward of No. 44, Balham Park Road, Balham, on the application of E. L. Schneider, on behalf of W. Wallis (*refusal*).

Rebuilding of the Trinity Presbyterian Church, St. Pancras, on the application of J. A. Macdonald on behalf of the trustees of the Church (*refusal*).

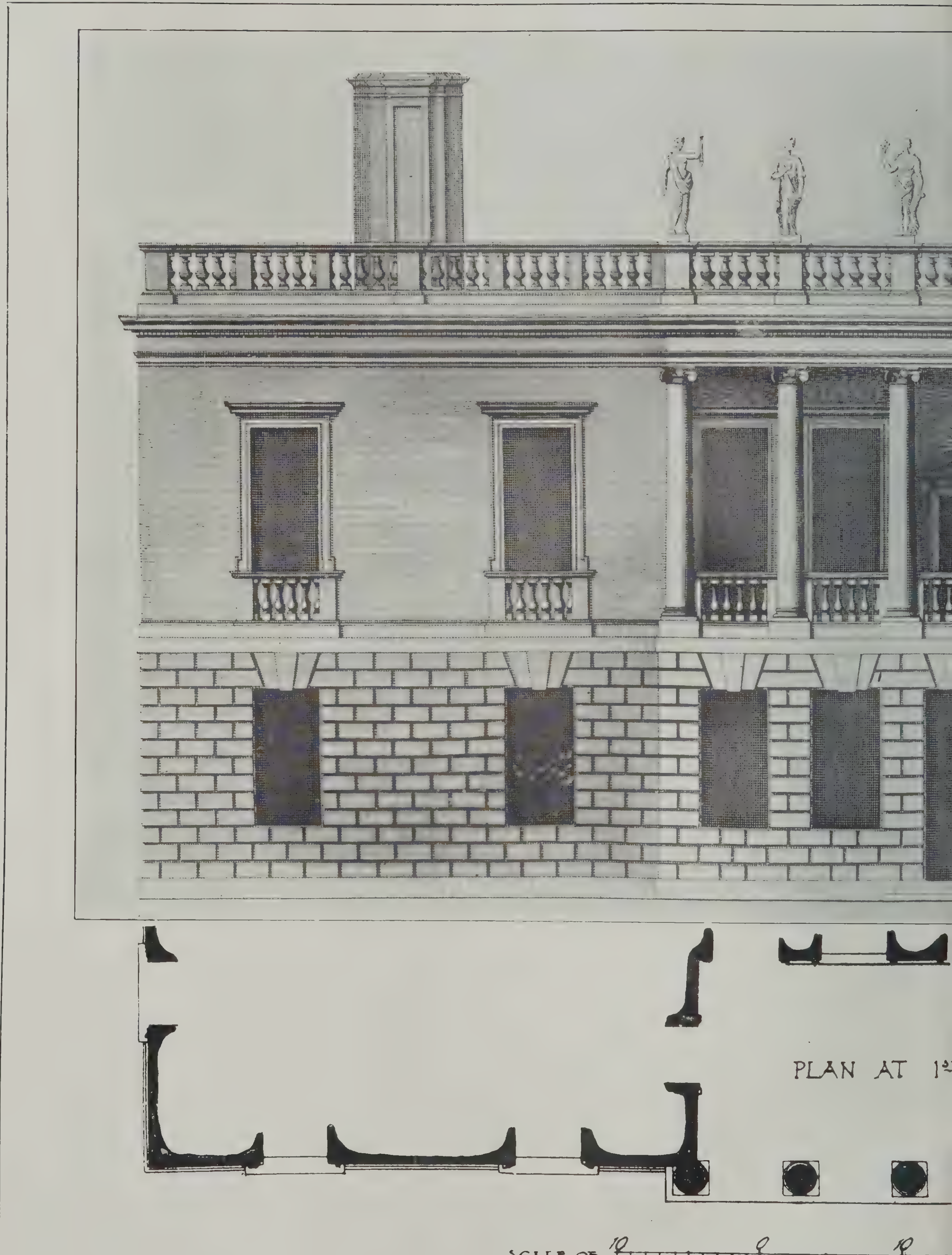
One-storey shop in front of No. 74, Caistor Road, Balham, on the further application of J. H. Beare (*refusal*).

Erection of a building to be known as No. 110, Beauval Road, East Dulwich, on the application of J. P. Granville (*consent*).

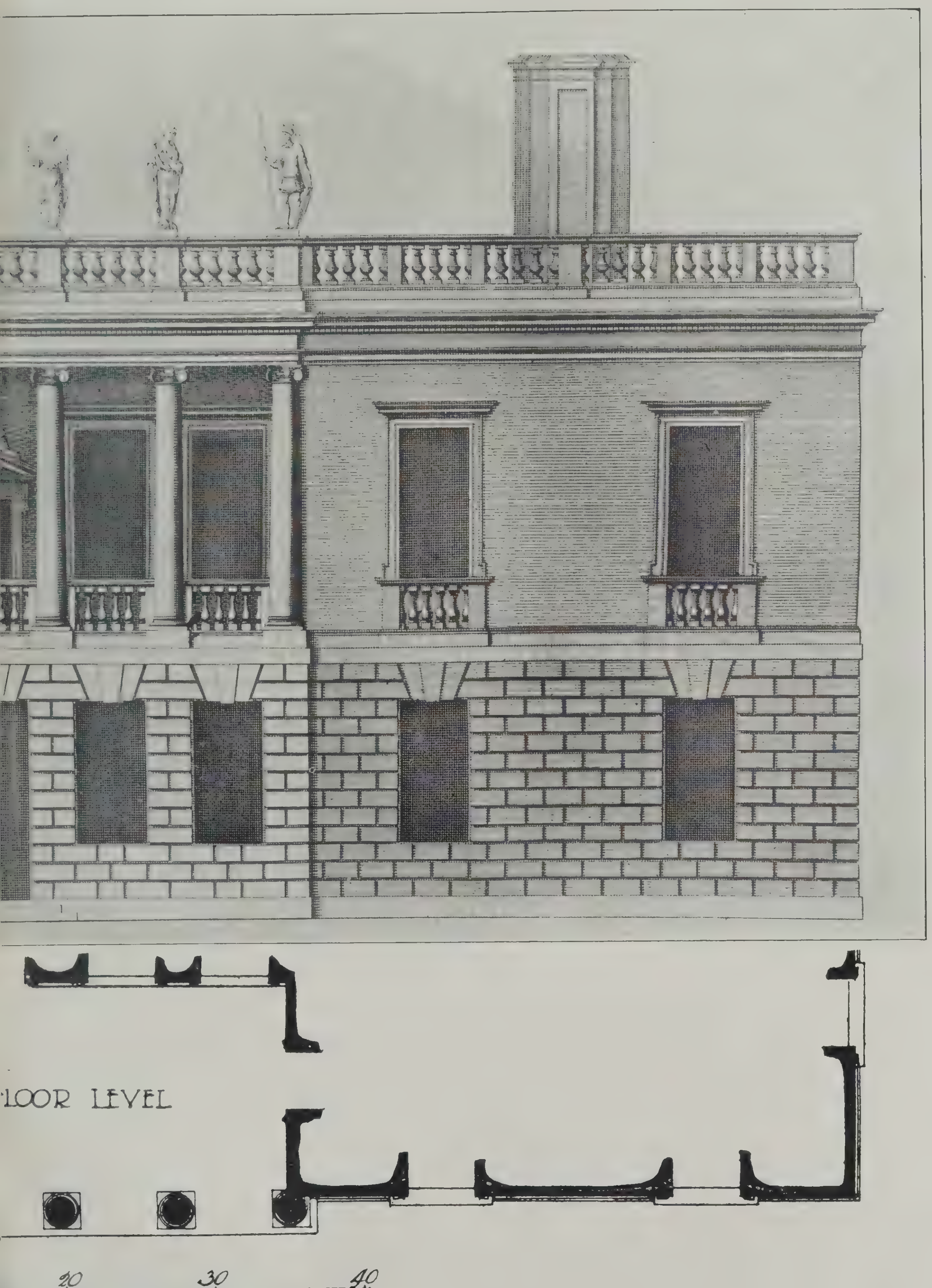
Erection of buildings on the site of Nos. 39, 41, 43, 45 and 47, High Street, Kensington, on the application of Chinnock, Clarke and Chinnock, on behalf of the Brasenose College Estate (*consent*).

Erection of seven houses on the south-eastern side of Catford Hill, Lewisham, on the application of Norfolk and Prior, on behalf of G. Walker (*consent*).

Erection of an electricity underground sub-station to abut upon the southern side of Short's Gardens, Holborn, on the application of Fladgates and Co., on behalf of the Charing Cross, West End and City Electricity Supply Co., Ltd., (*consent*).



THE QUEEN'S HOUSE, GREENV



N. INIGO JONES, ARCHITECT.

April 22, 1908. Volume 27 No. 689.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

Architecture and the Invention of Printing. Victor Hugo's statement that architecture was, "up to the fifteenth century, the chief register of humanity; that during this space of time no idea of any elaboration appeared in the world without being built into masonry; that every popular idea as well as every religious law has had its monument; in fact that the human race has never had an important thought which it has not written in stone" opens a wealth of thought. Omitting minor evidences and objections to the theory, let us see how this brilliant writer presents his arguments. From the beginning of things down to the fifteenth century of the Christian era, architecture was the great book of humanity, the chief expression of man in his various stages of development, whether as force or as intellect. The first monuments were mere fragments of rock, for architecture began like all writing—a stone was placed on end, and it was a letter, and each letter was a hieroglyph, and upon each heiroglyph rested a group of ideas, like the capital on a column. Later, words were formed; stone was added to stone; the Celtic dolmen and cromlech, the Etruscan tumulus, are words. Sometimes when there was plenty of stone a phrase was written, as exemplified in the huge temple of Karnac, which is an entire formulary. Finally, men made books, traditions gave birth to symbols, which grew, multiplied, and became more and more complicated. The first monuments were no longer able to contain them: they overflowed on every side, and thus architecture was developed on lines parallel with human thought. The original idea, the word, was not only at the base of all such buildings as the pagoda at Eklinga, the Egyptian Rhamseion, the Temple of Solomon, but it was present in their form. The latter building, for instance, was not merely the binding of the Holy Book—it was the Holy Book itself, and in each of its concrete halls the priest could read the word translated and made manifest. The form of the structure and, in a lesser degree, the peculiarities of the site chosen revealed the thought to be represented, but whether the symbol to be expressed was graceful and pleasing or gloomy and severe the architects of Greece crowned her mountains with temples harmonious to the eye. India hid hers within the earth and enriched them with subterranean pagodas of wonderful workmanship. Thus, for the first six thousand years of the world's history from the erection of the first pagoda of Hindostan to Cologne Cathedral, architecture was the great writing of mankind.

During the first period of the Middle Ages, while theocracy was organising Europe, while the Vatican "rallied and reclassified around it the elements of a Rome made up from the Rome which lay crumbling about the capital," then little by little arose beneath the inspiration of Christianity, under the hands of the barbarians, fragments of dead schools of architecture Greek and Roman. All the thought of the time is written in this sombre Roman style. "Authority and unity, the impenetrable and absolute, are everywhere evident, everywhere we find the priest, never the man; everywhere the caste, never the people."

Next came the Crusades, after which authority is shaken and unity is no more (as Feudality insists upon sharing with theocracy); the nobility penetrates the ranks of the priesthood, the commonalty those of the nobility. The face of Europe and the face of architecture is changed accordingly. It returned from the Crusades with the pointed arch, as the nations did with liberty. Then while Rome was being slowly dismembered, Roman architecture died. The architectural book no longer belongs to the priesthood, to religion, to Rome; it is the property of the imagination, of poetry, of the people. Hence the rapid and innumerable changes in this style of architecture which has existed but for three centuries, and is therefore in such striking contrast with the immobility of the Roman School, which has lived through six or seven. In those days thought was free, but in the direction only of those books called buildings. A close observance of some of the carvings reveals the license of thought written in stone comparable only to the present freedom of the press.

This liberty was frequently carried to great lengths and occasionally a doorway, a facade, or even a church offers a symbolic meaning absolutely foreign to religion and often even hostile to the church. Guillaume de Paris, in the thirteenth century, and Nicolas Flamel in the fifteenth, wrote such seditious pages—Saint Jacques de la Boucherie was a church of opposition throughout. What was accepted as suitable for the enrichment of a building would have been burned in the market-place by the executioner had anyone been rash enough to publish it in manuscript form, and the trend of thought expressed in the porch of a church would have brought its author to the torture had he recorded it in the shape of a book.

So, down to the days of the invention of printing, architecture was the principal, the universal writing. In this stone volume, begun by the East, continued by Greek and Roman antiquity, the Middle Ages wrote the final page. Moreover, this phenomenon of an architecture of the people taking, in the Middle Ages, the place of an architecture of caste and rank is reproduced with every analogous movement of the human intellect in the other great epochs of history. Thus, to state but briefly here a law which requires volumes for its development, in the Orient, the cradle of the primitive races, after Hindu architecture came Phoenician architecture, in antiquity, after Egyptian architecture came Greek architecture, whose Roman style is but an overloaded prolongation of the Carthaginian dome; in modern times, after Roman architecture, came Gothic architecture.

Whether he be known as Brahmin, Magian, or Pope, we are always conscious of the priest, and nothing but the priest, in Hindu, Egyptian or Roman structures. It is not so with the architecture of the people; their work is richer and less saintly. In the Phoenician school we are conscious of the tradesman; in the Grecian of the republican; in the Gothic of the burgher. In the fifteenth century everything changed because human thought discovered a means of perpetuation not only more durable and more resisting than architecture, but also simpler and easier. To the stone letters of earlier times succeeded the leaden letters of Gutenberg, and from the time of the discovery of printing architecture gradually decayed, withered, and died away. With the dawn of the sixteenth century it had ceased to be the essential expression of society in distress; it becomes classic art; from being Gallican, European, indigenous, it becomes Greek and Roman; from being real and modern it becomes pseudo-antique. "It is this decline which is known as the Renaissance, or revival. And yet it is a magnificent decline, for the old Gothic genius, that sun which is setting behind the gigantic press of Mayence, for some time longer pierces with its last rays all this hybrid heap of Latin arcades and Corinthian columns. It is this setting sun which we take for the light of dawn."

The Trustees of Leighton House and Crosby Hall. Details of the scheme for the re-erection of Crosby Hall in connection with the proposed settlement for University students at More House, Chelsea, having recently been made public, the trustees of Leighton House, Kensington, have now come forward with an alternative proposal which they thus describe: "Our scheme is that the old fifteenth-century building, with its famous and beautiful window, the stones of which remain intact as when erected in 1470, should find a place on the green lawn of the garden of the late Lord Leighton's house in Kensington (which has been open to the public for the last eleven years) and should be used as a free art library and for lectures and concerts." In a letter to the "Times" of April 13th, the Leighton House trustees drew attention to their proposal, as outlined above, which was under serious consideration before they were aware of the existence of a rival scheme to incorporate Crosby Hall with the More House settlement, and they rightly insist that the merits of the two suggestions should be carefully weighed and considered before any final steps are taken.

New Roofs and Old. A paper on "Roof Coverings" was read by Mr. George L. Allen, M.I.M.E., before the last meeting of the Associate Section of the Glasgow Institute of Architects. Mr. Allen said they need not conclude that because modern research might have put into their hands materials that enabled them to construct watertight roofs quite flat they would entirely discontinue to build sloping roofs. That sloping roofs would be abandoned in many instances was certain, but pitched roofs would remain, and their construction and decoration would continue to exercise the minds of architects. The lecturer proceeded to deal in detail with the various materials used for roof covering in present-day practice. He considered there was scope for improvement in the method of fixing slates, while looking into the near future he anticipated a much clearer understanding as to the sources, properties, and uses of asphalt. He anticipated that the idea of a light slate or tile being preferable to a heavier one would be modified, and that we would look with more favour on the heavier materials, and at the same time, as the present custom of fixing was undoubtedly insufficient, we should take advantage of any means that might present itself to more firmly secure these coverings to the roof. He anticipated the general adoption of flat roofs for all high buildings, a greatly extended use of reinforced concrete for sloping roofs, domes, and other prominent features, and that, in the finishing of these, asphalt would eventually take first place.

Municipal Architecture Once More. The subject of municipal architectural work came up again at last week's meeting of the Bournemouth Town Council. The General Purposes Committee, having considered the memorial from local architects on the subject, recommended: "(a) That the following resolution be passed by the Council: 'That the Council do not consider it advisable to lay down any general rule, such as is suggested, on the subject of architectural works, but prefer to leave it to be decided on the recommendation of the various committees concerned whether in any particular case the work, instead of being dealt with by the Borough Architect, shall be the subject of a public competition. (b) Preparation of quantities. On consideration of Mr. Broad's letter recommended that the matter be referred for the consideration of the particular committees who may, from time to time, be concerned with large works." The recommendations were adopted.

Coventry Municipal Buildings. It is quite refreshing to learn that Mr. Burns, President of the Local Government Board, has condemned the scheme brought forward by the City Council of Coventry for new municipal buildings, on the ground that the proposal to utilise the ground floor of the building for shops is "unworthy of the city," and his advice to the Council to reconsider the proposal and to formulate one that would fulfil all requirements, and at the same time be in harmony with the adjoining historic buildings of the famous city, is excellent. The architecture of our cities and towns has been far too long under the control of local shopkeepers, and other persons whose education and environments are, as a rule, sufficient to account for their total apathy with regard to the artistic aspect of any building schemes with which they may be connected; and we trust that the action of the President of the Local Government Board in thus drawing attention to the City Council's misapprehension of its duties will have a salutary affect upon the municipal authorities of other towns who may be engaged in discussing the details of proposals for public buildings of a similar nature.

BUILDINGS MOST LIABLE TO BE STRUCK BY LIGHTNING.

In the course of a paper on "Protection from Lightning" which he read before the last meeting of the Society of Architects, Mr. Alfred Hands, F.R.Met.S., said that the amount of damage caused by lightning in this country was very much greater than generally supposed. He had been compiling a chart of England and Wales, from particulars he had collected during the past 18 years. At present he had completed only a little over 11 years of the chart and there were now on it 7,793 spots, of which 3,401 represented buildings. A rough analysis of these buildings showed that churches form about 6 per cent. of the total; chimney shafts about 2 per cent.; and other buildings of a lofty type about 8 per cent.; leaving about 84 per cent. for comparatively low buildings. These figures might appear remarkable if one overlooked the fact that most of the loftiest structures had been fitted with lightning conductors, because they had been considered especially exposed to be struck. It was not possible to ascertain the number of conductors that had been struck, for, with the exception of occasions when lightning had been seen to strike, the only way one could tell that a conductor had been put to the supreme test and had proved satisfactory was by a small mark of fusion at the extreme point; but as regards the buildings more or less damaged, although fitted with conductors, Mr. Hands said he found that they formed about 2 per cent. of the total number of buildings damaged in this country. We were left to speculate whether the tallest buildings were, after all, less liable to be struck (a postulate that would not be reasonable); whether the points of the conductors had a very great preventive effect on lightning discharges, as theoretically they should have; and whether conductors did not usually fail when struck. The answer lay, he thought, between the second and third, but principally on the preventive effect of points, for it was an undoubted fact that a large proportion of the buildings fitted with conductors were not properly protected. The conductors had not been scientifically applied and were in many cases more or less inefficient. Efficient protection from lightning was neither the impossibility that some seemed to think, nor the very simple matter that others would have it appear. It was one that presented many difficulties, but these could be overcome. It consisted of more than the mere putting-up of lightning conductors; connections of little cost, and perhaps seemingly trivial, made across dangerous gaps, made just the difference between efficiency and non-efficiency. What was required was to bring knowledge to bear on the subject.

Correspondence.

The Granite Controversy in Birmingham.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—Since this matter is settled there is no need to re-open the controversy. Nevertheless, two facts should be noted. Firstly, the payment of granite masons in Norway is higher than the rates obtaining in either Cornwall or Scotland. Secondly, the tenders for Cornish and Scotch granites were made up when the price for Norwegian was known. But for the Norwegian competition no such tenders for British granite would have been received.—Yours truly, A.

Means of Escape.

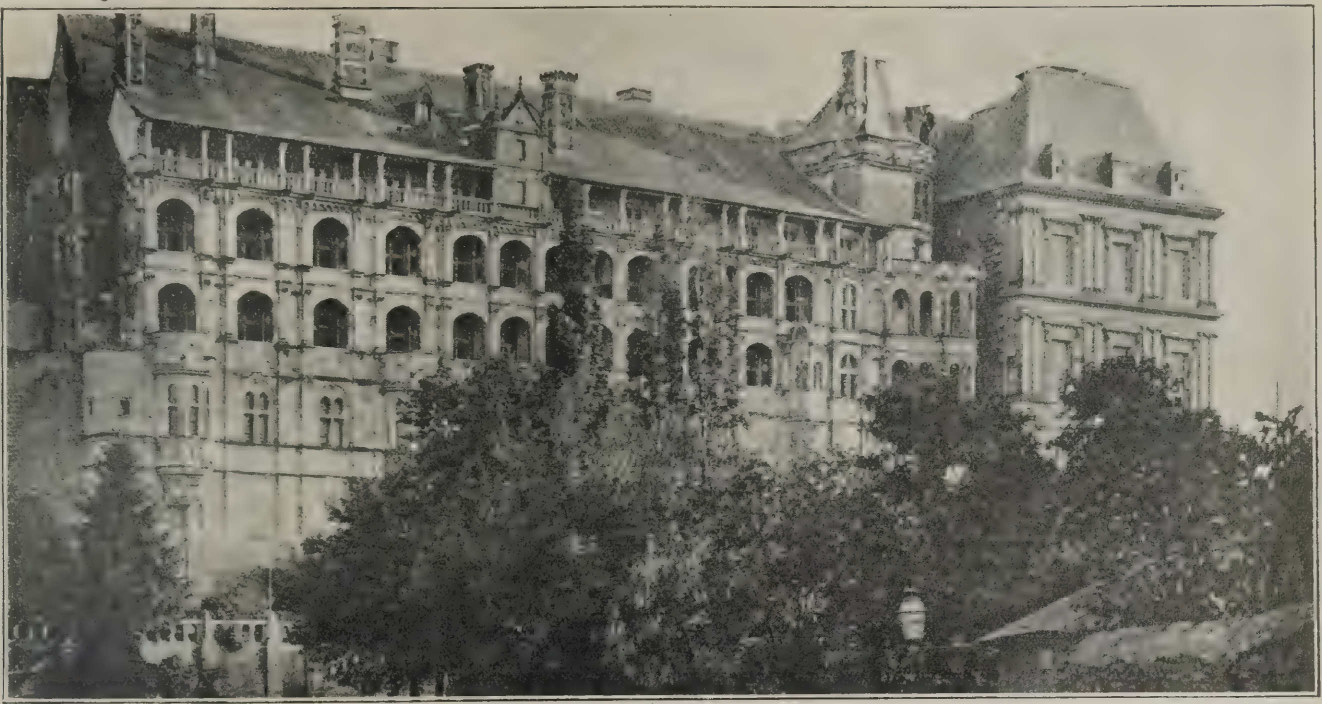
To the Editor of THE BUILDERS' JOURNAL.

SIR,—The fire which occurred on April 11th at Derby Street, Kingsland Road, Dalston, is another of those catastrophes which occur with unpleasant frequency. Only a few weeks ago it was Barnsbury. In each case the whole of the inmates could have easily been saved had there been a "means of escape to the roof," as provided by Section 12 of the Amendment Act, whereas serious loss of life is recorded in both instances. At Barnsbury the house was exempt from the Act, because its height was less than 30 ft. At Dalston, it is hard to say without measuring, but it must be a near thing—quite a matter of an inch or so, one way or the other. That is where the absurdity comes in. It would be more satisfactory if the Act included all houses which have two or more storeys above the ground-floor, and in which two or more families reside, or else let the height limit be reduced to 25 ft., which would have substantially the same effect.

Seeing that a reliable and effective ladder escape to the roof can be purchased and fitted at a very small cost indeed, there can be no valid excuse for not putting the Act into force even as it stands. We shall wait until possibly a few hundreds of poor souls have been roasted to death, and then someone with a very powerful voice will want to know this, that and the other. A great deal of fuss will be made, and here and there maybe someone will get hurt for neglect.

Yours truly,

EDWIN J. SADGROVE.



THE CHATEAU DE BLOIS, FRANCE: FRANCOIS I. WING.

THE CHATEAU DE BLOIS.

Situated upon the right bank of the river Loire, Blois, the present capital of the department of Loir et Cher, France, was formerly the chief town of a mediæval countship. It rose into notice towards the end of the 14th century, when Louis of Orleans, the son of Charles the Fifth of France, purchased from the Count of Blois the castle which dominated the surrounding plains. Subsequently the domain passed into the hands of that Duke of Orleans who afterwards became King Louis XII. During the reign of this king, and that of his successor, Francis I., immense sums of money were expended in enlarging, altering, and embellishing the building. Blois was a favourite residence of the last of the Valois kings (Henry III.) who, on two occasions, namely, in 1577 and in 1588, caused the States General to assemble there, but after the assassination of the Duke of Guise, in 1588, it fell into disfavour as a royal residence. In the reign of Louis XIII. the king imprisoned his mother, Marie de Medici, in his castle of Blois, and later he presented the estate to his brother Gaston of Orleans, who resided there for twenty-five years (1635-1660) and, on his death, left the château to his nephew, Louis XIV., who partially dismantled it and caused much of its rich furniture to be removed to Paris. Thus abandoned, the question of the demolition of this historical building was seriously discussed during the reign of Louis XVI., and many years later Louis XVIII. partly gave effect to the disastrous suggestion of the former king by transforming Blois into a military centre, and utilising the château for barracks. However, under Louis Phillipe, the architect Felix Duban commenced a series of restorations which, brought to a conclusion under the Second Empire, left the buildings much in the state in which we see them to-day.

Architecturally the château possesses, in an eminent degree, all the essential characteristics of the various phases of the French Renaissance, and in this respect it is of far more interest to the historian of art than are the neighbouring châteaux of Chambord and Chenonceaux. At Blois may be seen at their best the distinctive elements of the decoration of the transitional period of the late Gothic and early Renaissance, and of the development of the latter style when it was approaching its zenith.

The castle is entered from the *Place du Château*, through a richly-ornamented portal over which is an equestrian statue of Louis XII., set in a richly decorated canopied niche. The large inner courtyard, of irregular shape, is enclosed on its four sides by groups of buildings illustrating the varying details of consecutive periods of design. Of the original feudal castle, built in the 13th century by the Counts of Blois, little indeed now remains beyond the large hall (*La Salle des Etats*), the Moulin tower, partially rebuilt and re-decorated in the 15th century, and the isolated structure used as an observatory by the astrologers of Catherine de Medici, known as *La Tour de Foix*. The large hall immediately on the right of the entrance, and now restored to its original aspect, in which the meetings of the States General took place, consists of a spacious and lofty apartment (with an open roof), of which the external facades have been divested of much of their interest consequent on the various

CHATEAU DE BLOIS: PLAN.

"restorations" to which they have been subjected.

The portions of the château erected by Louis XII. include the structure placed on the east side of the inner court, known as the *Galerie de Louis XII.*, which was commenced in 1498 and completed in 1501, and the chapel (*Chapelle Saint Calais*). The external facade of the former building, containing the principal entrance from the *Place du Château*, constructed with walls of brick and stone surmounted by a high pitched roof, exhibits a vast amount of very carefully executed carving and other ornamental work.

The walls relieved by lozenge-shaped patterns of red and black bricks, the somewhat haphazard arrangement of the fenestration, the lavishly carved and enriched stone dormers and parapets, and the elaborately treated brick chimneys, all aid in producing an extremely interesting and picturesque composition, exemplifying French art of the period in its very best aspect.

The principal entrance consists of a boldly moulded semi-circular archway placed between engaged columns with Gothic caps, above which is a long narrow panel relieved by monograms and the emblem of the Orleans family—a crowned porcupine. The equestrian statue (a modern copy of the one destroyed in 1793) is set in a richly ornamented canopied niche, of flamboyant character, and below it are inscribed the following lines by Fausto Andrelini, the King's favourite poet :—

Hic ubi natus erat dextro Lodvicus Olympo,
Sumpsit honorata regia sceptia manu;
Felix quae tanti fulsit lux nuntia regis,
Gallia non alio principe digna fuit.
Faustus, 1498.

The internal facade of the *Galerie de Louis XII.*, which is flanked by two turrets containing staircases, comprises an upper storey with square-mullioned windows placed upon an open arcaded ground floor, the richly decorated flamboyant details of the elevation being, in other respects, similar to those of the entrance front.

The chapel, built by Louis XII. to replace the original structure, which had fallen into decay, was restored by Felix Duban. In one of its windows is a representation of the king's betrothal to Anne of Brittany (widow of Charles VII.), who was pledged, by special agreement in the event of her surviving her husband, to marry his successor.

The Francis I. wing, the finest part of the whole range of buildings, is a well-known example of the early French Renaissance. Owing to the peculiarities of the site, the northern or external facade consists partially of a three-storeyed galleried structure (left) and partially of one of two storeys only (right), but the enforced irregularity of the composition has greatly enhanced the picturesque appearance of the building. In other respects a very free treatment of design is observable, as many of the features, such as balconies, windows, chimneys, etc., are placed simply where the internal arrangement of the building suggests, and without much reference to the symmetry of the facade. However, the continuous open gallery, supported by short columns, which forms the attic and extends the whole length of the front, gives an aspect of homogeneity to the whole.

CHATEAU DE BLOIS: MANSART WING.

Originally it was only intended to construct one gallery to connect the *Salle des Etats* and *La Tour du Moulin*, and the facades had already been completed when the enlargement was decided upon and the whole expanse of loggia raised to its present height.

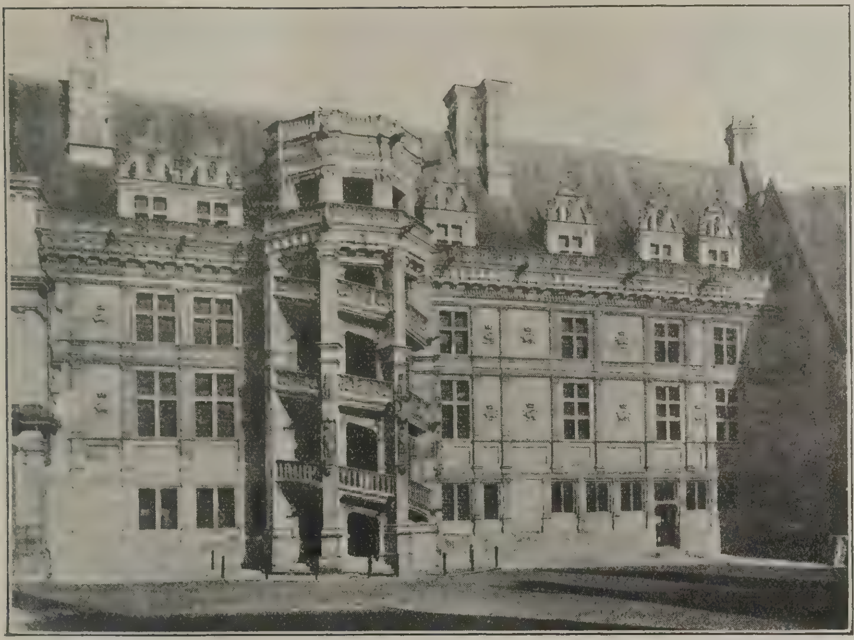
Traces of Italian influence are observable in many of the details of this outer facade, which is of rather later date than the inner one facing the courtyard. The latter, recently restored, has its three principal storeys pierced with plain square-headed mullioned and transomed windows set between slightly projecting pilasters, the wall spaces being enriched with a series of boldly-carved salamanders surmounted by the royal crown. The relative severity of the architectural treatment of the lower portion of the building adds to the value of the wealth of decoration bestowed upon the main cornice and balustrade, in which carved initials of the king and queen alternate with balusters. Niches formed in the gabled dormers contain amorini and a series of statues of the Seasons, and the brick and stone chimneys—profusely enriched with carving and ornamentation—add considerably to the decorative effect of the whole.

The wonderful staircase (*Escalier de Francois I.*), is a remarkable example of the French Renaissance, unique in its conception and perfect in the richness and the delicacy of its detail. Externally pentagonal on plan and occupying a central position in the facade in which it occurs, the internal course of the stairway is emphasised by a series of balustrades, inserted at each open stage between the main piers, enriched with carvings of foliage, of the letter "F," and of the ubiquitous salamander. The piers, which have delicately carved capitals, support a main entablature and balcony similar to those of the main facade, above which is an open attic storey. As in the case with numerous other architectural monuments, the name of the architect of this beautiful staircase is unknown.

The figure of "Diane Chasseresse" to the right of the entrance is probably the work of Jean Goujon, to whom the original statues placed in the niches of the piers, and representing Diane de Poitiers as "Peace," "Youth," and "Friendship," are also attributed.

The first floor of the building contains the apartments of Catherine de Medici, who died at Blois in 1589, and of Claude de France. The oratory of the former is formed in a projecting turret, and it was from a window of the adjoining study that Marie de Medici is said to have made her escape from the château. The apartments of Henry III., on the second floor, include two ante-rooms, the king's gallery, his study, bed-chamber, oratory, and library.

Internally, the rich decorations have been "restored" with a richness which is somewhat overpowering, but the magnificent fireplaces and marvellous wood panelling and ceilings at once attract attention. This portion of the castle is reminiscent of two historical events, namely, the assassination of the Duke of Guise in 1588, and the imprisonment of Marie de Medici, who fled from the castle in 1619. Of these occurrences the former had far-reaching consequences. At that time the king, Henry III., unable to maintain his position in Paris, where his troops had been forced to lay down their arms, was compelled by the Duke of Guise ("Balafré") to summon the States General at Blois. The deputies met and refused to vote the taxes of which the king was



VIEW IN COURTYARD, SHOWING THE WELL-KNOWN STAIRCASE.

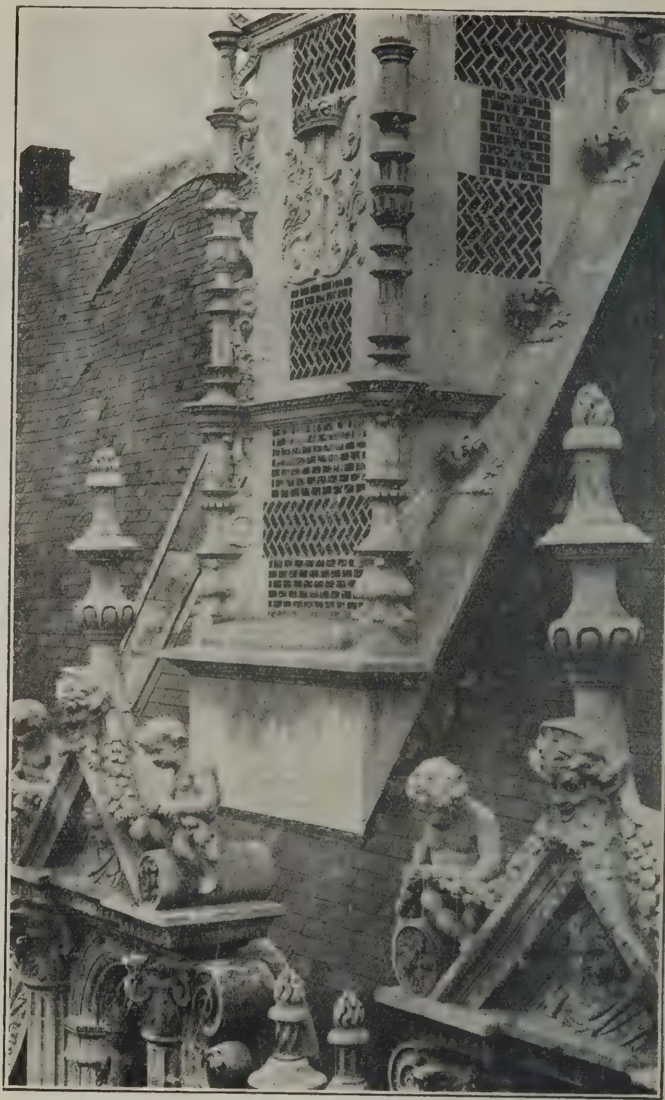
DETAIL OF STAIRCASE, FRANCOIS

PRINCIPAL ENTRANCE, WITH STATUE OF LOUIS XII.

in need, and violently censured him. In this parliament Guise was virtually the master, and the exasperated king resolved to get rid of him, and thereupon planned the murder. The hour and place (the ante-chamber of the king's cabinet) were fixed, but ominous rumours were abroad, and the partisans of Guise became alarmed, and he himself received admonitions from all sides warning him of his danger. One day he found on his table a note explicitly informing him of the king's design. Scarcely troubling to do more than glance at the letter, he wrote underneath it the words "He dare not," and tossed the note beneath the table. On the morrow (December 23rd) he presented himself at the council, the doors of which were closed, and an officer informed him that his attendance was required by the king. He directed his steps towards the king's cabinet, but immediately he entered it one of the guards plunged a dagger in his heart, whilst others threw themselves upon him and struck him again and again. The Cardinal of Guise, who, seated at the council, heard his dying brother's cries for mercy, was arrested and sent to the Moulin tower, where he was assassinated the following day, as were all the friends and relatives of his brother and himself who happened to be at Blois and were unable to make their escape.

The west wing, constructed for Gaston d'Orleans after the designs of Francois Mansart, formed part of a huge project, fortunately not carried out in its entirety, for demolishing the work of Louis XII. and Francois I., and rebuilding the château. Mansart's building comprises a three-storeyed structure, placed on the west side of the courtyard, of which the central portion is ornamented on the ground floor with coupled fluted Doric columns and on the first floor with similar columns but of the Ionic Order, the latter being surmounted by a small pediment on the sides of which are some much

CHIMNEY-PIECE IN SALLE DES OFFICIERS.



DETAIL OF CHIMNEYS AND DORMERS.

CHATEAU DE BLOIS.

mutilated figures of Mars and Minerva. The central portion of the second floor is crowned by a semi-circular pediment, over which is placed what was once a bust of Gaston d'Orleans. The well-designed circular colonnade of the Doric Order, which suffered much damage at the time of the Revolution, when the beautiful sculptural groups with which it was embellished, were completely destroyed, has been well restored.

VITIATED AIR IN BUILDINGS.

Some Additional Figures.

In our issue for April 8th we gave some figures as to the percentage of carbonic acid gas found in various buildings in the Manchester district, these figures having been obtained by Mr. W. Thomson as the result of a series of experiments and tests. As supplementing this information, we now give the following extracts from a paper on "Warming and Ventilating," by Mr. W. H. Casmey, A.M.I.M.E., read a short time ago before the Institution of Heating and Ventilating Engineers:—

The outside air is supposed to contain 1 part of CO_2 (carbonic acid gas) in 2,500 parts of air, and when this proportion is doubled inside a building the maximum percentage of impurity should be considered as reached; in fact in some of the textile trades the Acts of Parliament stipulate that 9 parts in 10,000 of air shall not be exceeded; to secure which it has been found necessary to supply about 2,500 cub. ft. of air per person per hour.

Here, however, comes the fact that the conditions of the atmosphere are a very variable quantity, as in times of fog the CO_2 in the outer air often reaches as high as 7 parts in 10,000, in which case to secure inside conditions of only 9 parts of CO_2 in the same volume it is necessary to supply more than 4,000 cub. ft. of air per person per hour, and this, of course, necessitates a proportional increase of heating surface if the same temperature is to be maintained. It is therefore evident that the purity or otherwise of the atmosphere plays a most important part in heating and ventilating work.

Under normal conditions we pass through our lungs 15 cub. ft. of air per hour, and if we are to keep the conditions of a room healthy, occupied by, say, 20 people, we must furnish ventilation in the proportion of 3,000 cub. ft. per head, or a total of 60,000 cub. ft. per hour, of course assuming that the outer air does not contain more than 1 part of CO_2 per 2,500 of air.

Harmful Conditions.

Within the last few weeks, one of our inspectors visited a large factory. In one room were 80 employees and in another 100; the only means of heating being ordinary gas jets. The CO_2 was 22.8 and 30 parts respectively in 10,000 of air, but no method of ventilation was in use.

Our municipal buildings, warehouses, offices, etc., are, as a rule, in no better condition than these works, and when we consider our churches, courts, theatres, music halls, and similar buildings, and in some cases even infirmaries and hospitals, we are brought face to face with conditions which should not be allowed to exist and which, to a great extent, are responsible for our high death rates.

The following extract from a lecture given eight years ago by Percy Bean, of Blackburn, bears on this point:—"The air in a well-known church in Blackburn on Sunday night at 8 o'clock gave 23.3 volumes in 10,000 in the basement, and 52.26 volumes in 10,000 in the gallery. The congregation had left the church when I took the samples of air, and the doors had been thrown open. In a police court, at the town hall, I found 15.5 volumes in 10,000. A sample of the air was collected from the Cotton Exchange at Manchester, and was found to contain 23.3 volumes in 10,000. In an elementary school I got 23.7 volumes in 10,000—and this was supposed to be an ordinary, well-ventilated room."

An International Exhibition of Building Materials is to be held in St. Petersburg, under the auspices of the Society of Civil Engineers, from May 28th until October 28th. The usual arrangements for free entry for exhibition goods have been made with the Imperial Custom House.

Liverpool Architectural Society.—The annual meeting of this society was held on April 13th, Mr. Edmund Kirby presiding. The annual report was presented and adopted, and the following officers were elected:—President, Mr. T. E. Eccles; vice-presidents, Mr. E. P. Hinde and Prof. C. H. Reilly. A valedictory address was delivered by Mr. Kirby, the retiring president.

LONDON CHURCHES.*

So much has been written and published in connection with London churches that it is surprising that Mr. Bumpus has been able to give such a special character to this, his latest work. He succeeds by several means. Firstly, by including most of the churches worth mention within a radius of six miles from the City, thus widening the field, and also permitting adequate consideration of the Gothic Revival as well as the periods of the Middle Age and Renaissance; secondly, by his own gossipy style, which permits him to discuss the art of Hippolyte Flandrin, the morals of Lady Hamilton, or the growth of Hymnology on the most slender excuse, and yet with the full consent of the reader; thirdly, by an unusual attention to the musical associations of the churches and their organs; fourthly, by an excellent criticism of the stained glass.

Before the Railways.

In the introduction we have a word-picture of London before the railways, when nearly all of Wren's fifty steeples were not only in existence, but standing freely above the roofs of the houses, and were unobstructed by railway stations or bridges. There must be still a few persons living who can remember St. Michael's, Crooked Lane, which was pulled down in 1831 to make way for the approach to new London Bridge. Since then 18 more City churches have been demolished, mostly Wren's.

The first volume is about equally divided between the mediæval and the Wrennian churches, and travels as far afield as to Hornsey, Tottenham, and Bow. Mention is made of the little-known Laudian chapel which stood on the site of the present Christ Church, Westminster, and was pulled down in 1841, before the historic interest of Caroline ecclesiastical architecture was appreciated. The author quotes St. Catherine Cree, and the Chapels of Lincoln's Inn and the Charterhouse as being the only remaining specimens in London.

A Tower designed by Wren when in his 90th Year.

Considering his great admiration for the tower of St. Michael, Cornhill, it is unfortunate that Mr. Bumpus did not obtain a better drawing of it for his frontispiece. This tower appears to have been designed by Wren in his 90th year, fifty years after his completion of the church. Bearing in mind his age, and that the style desired by the parishioners was not much understood or appreciated by Wren, the result is little short of marvellous. Another of Wren's Gothic steeples, that of St. Dunstan's-in-the-East, was indirectly a stimulant to the Gothic Revival. When the body of that church (mainly Classic) was rebuilt in 1817-21, it was decided to adopt Gothic in harmony with the steeple, which was done "in a manner so excellent as to make us consider it the first London church in which the details of the long dormant Gothic were reproduced with any intelligence."

Mr. Bumpus does full justice to the dignified interior of St. Martin, Ludgate, and points out that by devoting the whole of the south end of the site (St. Martin's is longest from north to south) to entrances, lobbies, and a tower, Wren withdrew the body of the church from the noisy street and yet preserved its orientation. He reminds us that for a similar reason Gibbs abstained from inserting a lower range of windows in St. Mary-le-Strand; also that in front of this latter church it had been proposed to erect a column, 250 ft. high, surmounted by a statue of Queen Anne. Curiously enough, on the Queen's death the parishioners clamoured instead for the orthodox steeple, and Gibbs had to oblige them as best he could. The main walls of the church had already risen some 20 ft., and the setting-out only enabled him to obtain the bulk he desired in one direction—that is, across the width of the church: hence the oblong steeple we see to-day.

St. Andrew's and the Viaduct.

The view of St. Andrew, Holborn, shows how exceedingly well placed was that church prior to the construction of the Viaduct. The broad flights of steps up to the entrance remind us of St. Ann, Blackfriars, but the churchyard of St. Andrew was then so much more spacious than that of the latter church.

The second volume is concerned with the Gothic Revival. Mr. Bumpus tells the story with enthusiasm and discrimination, embellished with humour. His account of the timidity with which the parishioners of new St. Luke's, Chelsea (erected 1820-4) viewed their stone vault and flying buttresses, and of the panic which ensued one evening when the pendent candelabra were invisibly lowered *before* the congregation had left the church, is most amusing. Anyone acquainted with the remarkably proportioned tower of St. Mary's, Haggerston, will appreciate the legend that Nash had told the builder to go on with it until he had orders to stop, and then went into the country on another job and forgot all about the matter! And then we have the story of Pugin, who, when applied to by a Roman Catholic prelate for designs for a "very large," very handsome, and very cheap church wrote, "My dear Lord, say 30s. more and have a tower and spire at once."

The author has the highest possible opinion of English Gothic, even claiming for it superiority over that of the Domain Royale, and his taste in the matter of its revival may be judged from the following paragraph: "George Gilbert Scott, in St. Agnes, Kennington Park, and All Hallows, Southwark; G. F. Bodley, in St. Michael's, Camden Town, and Holy Trinity, Kensington Gore; Ninian Comper, in St. Cyprian's, Dorset Square; and Temple Moore, in the lately finished All Saints, Tooting, by exercising an austere reserve of ornament, a scholarly and refined proportion, and a delicate and fastidious taste in colour, have succeeded in producing some of the most beautiful churches raised in England since the Reformation."

Even admirers of All Hallows will be a little surprised to read that the view of it externally from the south-east "is one of the finest things in the whole range of modern architecture."

Mr. Bumpus objects to western galleries "in pointed churches," but does not fail to do full justice to St. Augustine's, Kilburn, and St. John's, Red Lion Square, where they exist. Such sumptuous churches as All Saints', Margaret Street, St. Augustine's, Queen's Gate, and Holy Trinity, Sloane Street, naturally receive detailed criticism. The author reverts again and again to the church of St. Matthias, Stoke Newington (Butterfield), and confesses the influence which constant familiarity with this impressive edifice had upon his own early life.

The portion of the work dealing with the modern churches is exceedingly well written, and the writer is evidently in love with his theme. He is angry at the removal of the great rood screen which Pugin placed across the nave of St. George's Cathedral, Southwark. He pleads for the alternative use of Renaissance in English church architecture "when modern art might express itself in a thoroughly modern way," when the singers might be accommodated in galleries on either side of the altar, and the altar itself brought nearer to the congregation.

So broad is Mr. Bumpus in his sympathies that we are the more amazed at his reference to the Dutch congregation at Austin Friars as a "miserable sect." Can he be sure that any other religious body would have so persistently rejected offers to purchase their church and site, offers usually estimated to be not less than half a million pounds?

That there should be one or two mistakes in a comprehensive work of more than 800 pages is inevitable. Mr. Bentley is mentioned in connection with the restoration of St. Botolph's, Aldersgate. This, however, should read "Aldgate and Bishopsgate." No reference appears to the remarkable church of St. Anselm's, Davies Street, Mayfair, designed by Messrs. Balfour and Turner, a church which deserves far more attention than it has received, both on account of its accomplishment and its power of suggestion.

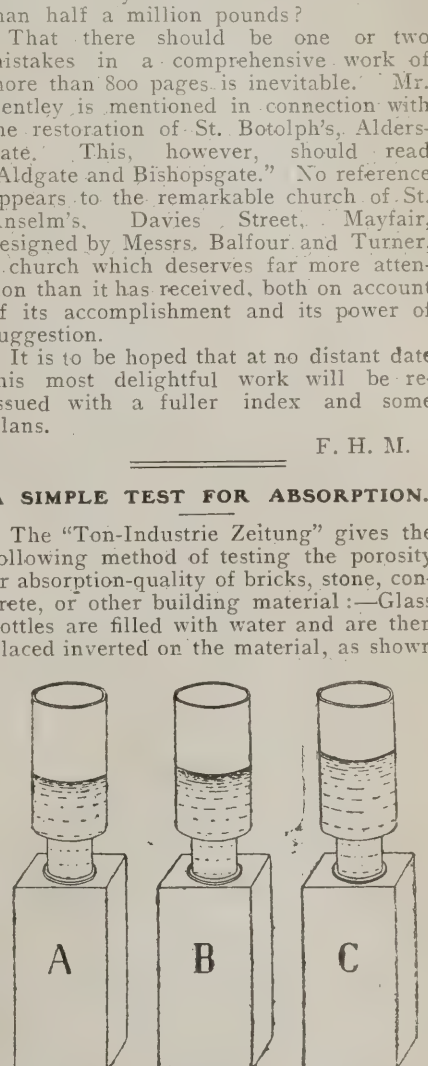
It is to be hoped that at no distant date this most delightful work will be re-issued with a fuller index and some plans.

F. H. M.

*"London Churches, Ancient and Modern," by T. Francis Bumpus. London: T. Werner Laurie. Clifford's Inn. Price 12s. net.

A SIMPLE TEST FOR ABSORPTION.

The "Ton-Industrie Zeitung" gives the following method of testing the porosity or absorption-quality of bricks, stone, concrete, or other building material:—Glass bottles are filled with water and are then placed inverted on the material, as shown



by the above illustration. It is seen at a glance that block C has absorbed less water than blocks A and B, and the comparative amount of liquid left in the bottle clearly shows the comparative density of the material.

ERRATUM.—In the report of a floor test published on p. 336 of our issue for last week, an error occurs in the table of deflections, where "¼ bore" appears; it should, of course, be "¼ bare."

Notes and News.

PROPOSED TOWN HALL EXTENSION AND ASSIZE COURTS AT NEWPORT.—The proposed extension of Newport Town Hall and the suggested provision of assize courts was before the Corporation last week, on a recommendation that the borough engineer should prepare a report upon the feasibility of an extension to Corn Street. The matter was left in the hands of the Works and Parliamentary Committees.

* * *

THE DELTA METAL CO. are making considerable additions to their jetty at East Greenwich. Messrs. Mark Fawcett and Co. (whose works almost adjoin the Delta Metal Co.'s) are providing and erecting the steelwork.

* * *

CHANGES OF ADDRESS.—Mr. R. Angell, architect, has removed his offices from "Garrick House," Adelphi, to "Keith House," 133 and 135, Regent Street, W. Messrs. S. B. Bolas and Co., photographers, have removed from Oxford Street to Kingsway House, Kingsway, W.C. (Telephone, 3245 Gerrard.)

* * *

A NEW CATALOGUE has just been published by M. Edmond Coignet, of 20, Victoria Street, London, S.W. This not only describes the Coignet system in detail, but provides a great deal of valuable information in regard to the many structures that have been erected, or are in course of erection, on the Coignet system in this country, together with illustrations and descriptions of work executed abroad on the Coignet system. The catalogue is well produced and forms a valuable record of reinforced concrete construction.

* * *

THE NEW MARINE DRIVE AT SCARBOROUGH, which connects the North and South Bays, was opened to the public recently, although the official opening will not take place until later. The work has taken eleven years to construct, and has cost over £100,000. A further heavy expense—it is understood about £8,000 to £10,000—will be necessary, for caissons are to be sunk deep in the shale at the front of the sea wall to prevent any further forward movement as the result of storm havoc.

Our Plate.

The Queen's House, Greenwich.

The Queen's House, Greenwich, built for the Queen Mother in 1635, consists of a square two-storeyed structure planned with small internal courtyards. The most noticeable feature of the building is its entrance hall which forms a cube of 40 ft. and is provided, at the first-floor level, with an open gallery supported by consoles. The Queen's House is now the attractive end feature of the fine vista looking from the river, formed between the blocks of buildings designed by Webb and Wren.

Notes on Competitions.

Technical College Extension, Sunderland.

Mr. Alfred W. S. Cross, M.A., F.R.I.B.A., the assessor in this competition, has made the following award, which has been adopted by the Town Council: 1st, Messrs. Brown and Spain; 2nd, Messrs. Vaux and Marks, both of Sunderland, the competition having been limited to local architects.

Yeadon and Guiseley Secondary School.

At a meeting of the Governors of the Yeadon and Guiseley Secondary School held last week, a letter was read from the West Riding Education Committee stating that the Committee had decided to confirm the decision of the Governors to accept the plans marked "F" for the proposed secondary school for the district, the second premium being awarded to plans marked "K." The sealed envelopes were then opened, and it was found that the first premium (£35) had been won by Mr. William M. Broadbent of Leeds and Horsforth, and the second (£20) by Mr. Philip A. Robson, of Westminster.

Elementary School, Bootle.

This competition has been settled in favour of Messrs. Crouch, Butler and Savage, of Birmingham, whose design (No. 67) has been accepted by the Town Council. 149 designs were submitted. The school is to accommodate 1,000 children and will cost £11,000.

Day Training College, Dudley.

Messrs. Crouch, Butler and Savage are also the successful architects in this competition, which was limited to 30 selected architects who had experience of school work.

Wesleyan Church and School, Feltham.

Messrs. Crouch, Butler and Savage, again, are the architects who have been selected in this competition from among five others who were invited to submit designs. The buildings will cost about £5,000.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.		COMPETITION.
May	1	ENLARGEMENT OF PRINCESS ALICE HOSPITAL, EASTBOURNE.—Limited to local architects. Premium £25. Particulars from J. H. Silkstone, 6, Bedfordwell Road, Eastbourne.
May	1	FARM BUILDINGS—Premiums £50 £25, £15 and £10. Particulars from Thomas McRow, Secretary, R.A.S.E., 16, Bedford Square, W.C. Summary in BUILDERS' JOURNAL, March 25th.
May		DOOR AND WINDOW FITTINGS.—(Assessors, Mr. Henry T. Hare, F.R.I.B.A., and Mr. Leonard Stokes, F.R.I.B.A.). Premiums of 15, 5 and 3 guineas. Particulars from N. F. Ramsay & Co., 1, Victoria Street, Westminster.
May	14	SCHOOL AT KINGSDOWN, BRISTOL (to accommodate 500 children).—Limited to local architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May	15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May	20	SCHOOL AT BRIDLINGTON.—Limited to local Architects. No premium. Particulars from G. G. O. Sutcliffe, Quay Road, Bridlington.
May	23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May	31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June	1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
1909. Jan.	1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date: final competition to be limited to six competitors.
Date not yet fixed.		SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall Eccles, Lancs.

REFORMATORY SCHOOL AT KENILWORTH.

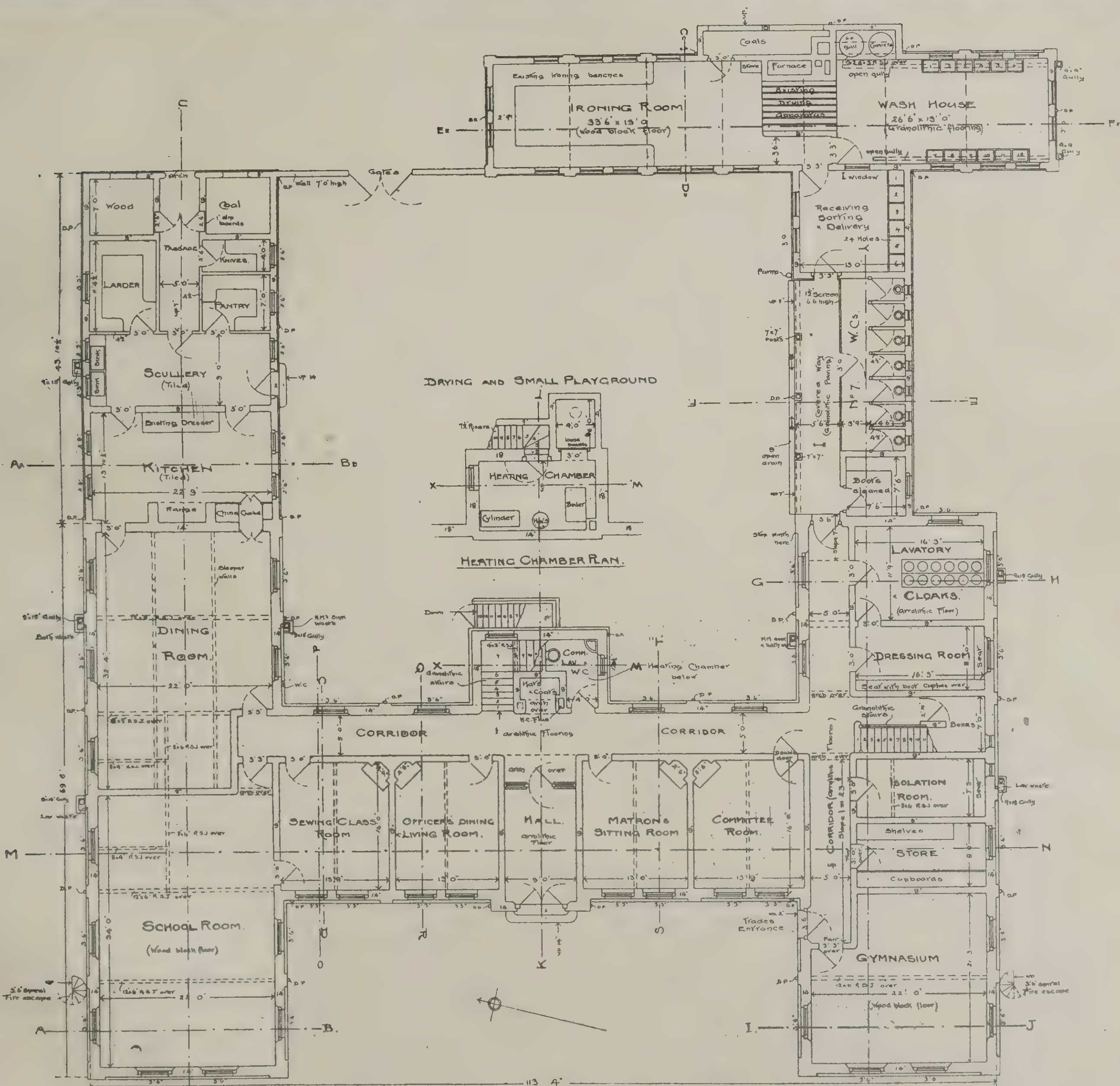
This new institution for girls, which is now in full working order, was recently erected for the committee of the Warwickshire Reformatory Institutions on Villiers Hill, near Kenilworth, an excellent site of two acres. The strictest economy and simplicity had to be considered in designing the new buildings. Selected Kenilworth stock bricks from Messrs. Hawkes' yard are used throughout the elevations, with Lawrence's rubbed bricks for window heads and Monk's Park bathstone for keys and sills. A stone hood with leaded oriel above forms a feature to the main entrance. The roofs are covered with Hartshill sand-faced handmade brown tiles, with similar saddleback ridges. Internally the walls are plastered and treated with "Duresco." The main ground-floor corridor has a dado of brown glazed bricks with wide, white joints. The laundry has a dado of white glazed bricks. The building is planned for 45 girls and a staff of five officers, and contains a large schoolroom, classroom, dining-room, committee and officers' rooms, gymnasium, dressing room and lavatory, kitchen and ample offices. On the first floor are four large dormitories, each being capable of close supervision from adjoining officers' bedrooms; smaller cubicles are provided for the elder girls. Four bathrooms are provided, and similar accommodation for the officers, with adjacent lavatories. A sick-room is placed in one of the rear wings, where the greatest privacy is ensured. Isolation rooms appear on both floors. The hand laundry is attached at the back of the building, connected by a covered-way, and will form a source of profit to the institution, public washing being undertaken.

The dormer windows to the bedrooms break up the long mass of roofing as well as serving for upper ventilation and increased light. Four fire hydrants are available, two inside and two outside, and besides the provision of fire-proof staircases there are external iron spiral stairs leading from the large dormitories in the wings.

The building is heated throughout by hot water on the low-pressure system from a boiler below the central staircase. The general contractor for the work was Mr. Charles Hope, of Berkswell; Mr. James Cramp acting as clerk of the works. The following special firms were employed in the building: Heating and hot-water supply, Messrs. Jones and Attwood, Stourbridge; "Granolithic" floors and staircases, Stuart's Granolithic Stone Co., Ltd.; terrazzo paved floors, the Arrolithic Co.; fire escapes and grates, Geo. Wright, Ltd., and Standard Range Co.; kitchen range, S. Flavel and Co., Leamington; sanitary fittings, W. E. Farrer, Birmingham; laundry fittings, T. Bradford and Co.

A small porter's lodge is erected at the head of the long drive which leads up to the Reformatory School.

The buildings have a west aspect of 113 ft. and occupied a year in erection; they were carried out well for the low cost of £6,000, inclusive of heating, lighting, fittings, drainage, road-making, etc.; this sum was principally raised by public subscription, whilst the site was generously presented by one of the committee. Mr. Charles M. C. Armstrong, of Warwick, was the architect for the whole of the work.



Ground-floor Plan.

REFORMATORY SCHOOL FOR GIRLS, KENILWORTH. CHARLES M. C. ARMSTRONG, ARCHITECT.

(For particulars see preceding page.)

Enquiries Answered.

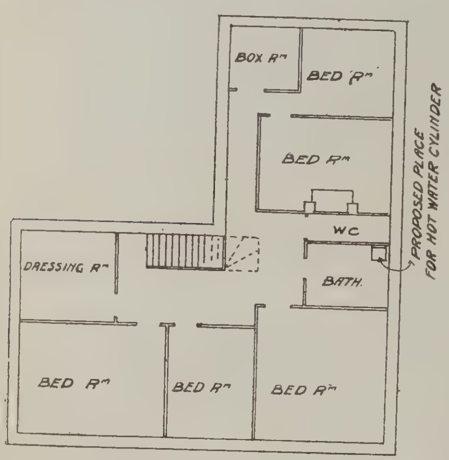
Correspondents are particularly requested to be as brief as possible.

The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.

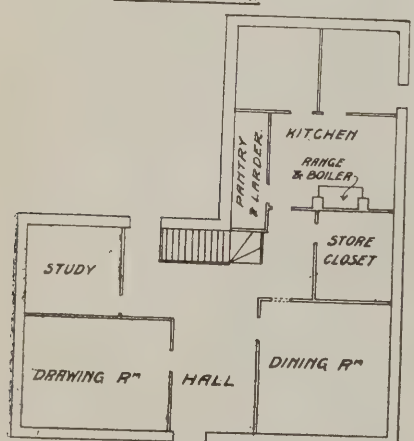
The querist's name and address must always be given, not necessarily for publication.

Hot-Water Supply.

WALLINGFORD.—X writes: "Herewith I give sketch plans of a house. (1) Which would be the best and cheapest way to get the hot-water supply to bath, and which would be the best place for the hot-water cylinder? (2) Would it be in the bath-room, where it is proposed to



FIRST FLOOR.



GROUND FLOOR.

have a linen press, so that it could dry linen and wet towels, etc.? (3) Which is the best timber roof truss for a house of this shape? (4) It is desired to have half-dormer windows on the top floor—would a collar-beam truss be suitable? (5) Which is the best form if half-dormer not specified?"

(1) In a house of the size stated, from the cooking-range in winter and from a gas-heated water circulator in summer. For the latter a separate flue in the chimney is needed to take away the gas fumes, but this flue can also be used to ventilate the kitchen by an opening at the cornice. The gas water-heater is not a "geyser," but an enlargement from that type. (2) The bathroom is the best place for the hot-water reservoir, and let it stand open to the room. Towels can then be placed on it, where they will dry sooner than on a rail of hot-water pipes. If heat is desired in the press itself, lay a pipe from the cylinder to the pipe supplying the taps, and fit a stop-cock to each end of the heating pipe, and an air-escape pipe at its highest point led up to a level higher than that of the cold-supply reservoir. (3) A hipped roof; if you think the walls are not strong enough to stand up to the thrust, buttress the quoins with 23 in. by 4½ in. piers, and spread the pier footings to a yard by 9ins. The bricks from the gables will be more than enough for this. (4) Yes. (5) King-post truss, with hipped ends, and all chimneys on inside walls: this needs brick walls the full height of the first floor. As cost seems to be important, a mansard roof could be used for all the top floor. In comparing costs, the basis must not be builder's cube, but the cubic feet, or better, cubic yards of space in the rooms and the square yards of floor. INGENIOR.

Black Pointing.

Referring to the enquiry under this head on p. 313 of our issue for April 8th, J.E.B. writes: "I have seen some very good black pointing mortar made by mixing tar with ordinary lime and sand. The quantity of tar required can easily be found by trial. This pointing is tough and durable, and can be made as black as desired."

A Method of Underpinning.

LONDON.—S. writes: "On page 297 of your issue for Apri 1st, you show an ingenious method of raising the upper part of a wall, where it was necessary to make two rooms into one. It is pointed out that the usual way would be to put needles through and support the upper part of the wall while the lower part was removed. You say Mr. Michael Brophy adopted the method shewn in Figs. 1 and 2. I do not quite see, however, how the lower part of the wall was cut away, and the girder put in, so that the pieces of tube could be used as screw-jacks. Can you enlighten me?"

Of course needles were used to support the wall while the lower part was cut away in order to enable the girder to be put in place, but instead of there being a bressummer, which would deflect when the needles were removed and the weight thrown on it, the girder was given its deflection by being made to take up the load, and the wall was even pushed back into its original position, so closing the cracks and allowing the needles to be withdrawn, if desired, before the bricking-up took place. All packing by wedging between the wall and bressummer or girder was also obviated by the adoption of the novel form of screw jacks.

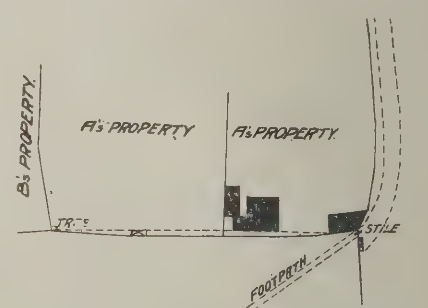
Drain Testing.

Z.Z. writes: "A, proposing to take a house about twenty years old, instructs a surveyor to test the drains. This the surveyor does, and finds that they do not satisfy the water test. On opening up the drains they are found to be defective. Now the landlord threatens to take proceedings against the surveyor for damage caused to the drains, as he says (a) that the water test should not be applied to any drain more than two years old; (b) that his permission should have been obtained before the test; (c) that the sanitary authorities have not the power to, nor do they, use the water test for old drains. What are the landlord's powers in the circumstances? Would a couple of Kemp's testers be a fair test for these drains? They are outside, in concrete, and under 6ft. of clay. If not, what is the most easily applied efficient test?"

(a) The water test is a very searching and it is hardly fair in such a case. I should certainly not advise a client to agree to such a test, as it is hardly possible for a drain 20 years of age to stand it. (b) I agree that the owner's permission should have been obtained. (c) I do not know but that their powers would extend so far if they wished it. As a matter of fact, however, I have never known a sanitary authority to use the water test to old drains. The smoke test is that usually adopted, and is reasonably sufficient in all cases. That or the peppermint test may be employed, but I personally prefer the smoke test. F.S.I.

Encroachment on Land.

GLOUCESTER writes: "The accompanying sketch represents a portion of farm belonging to two different owners, A and B. The dotted line represents the original boundary of A's land. B has just discovered that A has put his fence forward to the extent shown upon plan in



black line, thus taking away from B's land about 44 sq. yards. The ditch on B's side has also been widened. My client B wishes me to stake out the line of ditch, taking as a datum the centre of old fence line. Should a solicitor be consulted by my client before filling in the ditch when staked out? The only means of identifying the old boundary is the Ordnance map revised in 1900."

Your client appears to have a very bad neighbour, but are 44 sq. yds. valuable enough to warrant him in running the risks of an action? I much doubt it, and my own experience in such cases would lead me to suffer a great deal of petty encroachment and annoyance before I invoked the aid of the law. It is true that the filling-in of the ditch by you would throw the onus upon A, but I much doubt the expediency of the course proposed. So far as you personally are concerned, you have no liability for damages, provided you are properly authorised by your client to take the particular action he wishes—you only act as his agent, and the liability is therefore his. F.S.I.

A Contract Question.

A.B.C. writes: "A contracts with B to erect a row of cottages by (not on or before) June 24th, 1908, under a weekly penalty in default (by way of liquidated damages) of an amount equal to the estimated weekly rental. A presses on with the work and is finished in time for the houses to be occupied by March 25th. Is he entitled to the rent received from Lady-day to Midsummer?"

No; the contract to build the houses for a certain sum by a certain time is all that concerns A. He will get the payment of the contract sum so much the earlier and that is all—his expeditious work does not constitute him "the landlord" for the time being! X.

CONCRETE AND STEEL SECTION.

(MONTHLY).

The Shear Strength of Concrete.

Considerable diversity of opinion exists as to what is the real shear strength of concrete. This has resulted from the variation evidenced in the results of tests. It is difficult to conduct a test as regards the shearing strength of concrete. A good many tests have been made in concrete in single shear by applying a cutting edge to the concrete, but the testing machine does not always work accurately when used in this way, and a certain amount of bending action takes place. In experiments conducted for double-shear a bending moment is almost always produced. The coupling used should be very accurate, and the ends of the piece tested should be thoroughly clamped to overcome this. Some experiments have also been carried out in the United States by endeavouring to punch holes in concrete plates. Numerous tests have been made, but in the majority of cases the material is more in the nature of cement mortar than concrete. The results of American and Continental experiments are not of so much service to us, because practice abroad differs from that followed in this country. In the United States a great deal of poor-quality concrete is used, and it may be this reason which has shown the shearing strength to be such a considerable proportion of the compressive strength.

M. Considère takes the tensile strength of concrete to be one-tenth to one-twelfth of the compressive strength, and places the shear strength at 20 to 30 per cent. higher than the tensile strength.

Professor Spofford, at the Massachusetts Institute of Technology, obtained 1,082 lbs. per sq. in. as the shearing strength, and 2,457 lbs. as the crushing strength of 1:2:4 concrete, and 560 lbs. and 1,225 lbs. respectively for 1:3:5 concrete, and 612 lbs. and 1,104 lbs. respectively for 1:3:6 concrete. These tests would suggest that the shearing strength is very nearly half the compressive strength.

Some further tests conducted by Professor Spofford on cylinders 5 ins. in diameter, with the ends securely clamped in cylindrical bearings, gave the following results:—

Proportions of Concrete.	Shearing Strength lbs./in².	Compressive Strength lbs./in².	Ratio of Shearing to Compressive Strength.
1 : 2 : 4	1,480	2,350	·63
1 : 3 : 5	1,180	1,330	·89
1 : 3 : 6	1,150	1,110	1·04

Tests made at the University of Illinois on rectangular specimens tested in a similar manner gave the following results:

Proportions of Concrete.	Shearing Strength lbs./in².	Compressive Strength lbs./in².	Ratio of Shearing to Compressive Strength.
1 : 2 : 4	1,418	3,210	·44
1 : 3 : 6	1,250	2,290	·57

Tests made by punching through plates gave shearing strengths varying from 37 to 90 per cent. of compressive strength, the value depending upon the form of test-piece. It seems logical that the shear strength with a poor concrete made with a large quantity of aggregate should be higher than a concrete of richer quality under a direct shearing test, because the division would then have to take place along a plane cutting through the pieces of aggregate, so that the shear strength would be that of the aggregate, whereas the compressive strength would really depend upon the cementing of the particles of aggregates together—imperfect in the case of a poor mixture. With a richer mixture, however, by reason of the aggregate, the shearing would not be quite so much, and the crushing strength would be proportionately greater than the shearing strength developed. This is borne out by the tests above referred to; for, with a rich quality of concrete the tests seem to show that the shearing strength is .4 to .6 of the compressive strength. Of course, when a homogeneous material fails by crushing, it really fails by shearing along the planes of fracture, the resistance to crushing being the shear strength along these planes plus the friction of the surfaces against sliding. The friction is, however, not a very great matter, and from recent investigation upon tests on good quality concrete (not cubes, but upon prisms where the test-pieces were allowed to fail by shearing on correct angles) we have come to the conclusion that the division is upon planes inclined at an angle of about 70 degs. to the horizontal, and that the shear strength, both from a theoretical and practical determination, is about one-fourth to one-third the compressive strength, i.e., the compressive strength is determined by dividing the stress by the area of the section measured on a horizontal plane, whereas the shear strength is the load divided by the inclined planes upon which fracture occurs, and as these are greater in area than the horizontal plane, the shear strength is less. Such is a rough view of the shearing strength of concrete. Concrete, however, is usually strong enough in direct shear, and the failure of beams by what has been termed shearing is a misnomer; the failure is really by diagonal tension.

The Concrete Block Industry.

It is remarkable what progress has been made during the last year or two in the manufacture of hollow concrete blocks for building purposes. Concrete blocks have been made for many years past, but it is only since about 1905 that the manufacture was conducted upon the present economic principles of using machines for moulding the blocks. There are various types of machines on the market, most of which have been derived from America. The cost of structures erected with concrete blocks is not always less than bricks, but under many conditions concrete blocks are cheaper. This applies generally to situations where bricks are not easily obtainable, and where a long cartage would be necessary. In such cases concrete blocks can be made conveniently on the site from aggregates obtainable there, or in the immediate vicinity; the only material then that will have to be brought any distance is the cement, and as this is the smallest quantity, the freight is not much. In the past the blocks were made of solid concrete, but walls so constructed were not only heavy and awkward to build, but were not found to be either so weather-proof or sufficiently resistive to heat and cold. The air-space in the hollows of the modern block keeps a building warm in winter and cool in summer, and there is not so much risk of moisture condensing upon the walls, though it is always best for the interior of a building to be plastered. Concrete block buildings can be made decorative in appearance; although there is a tendency to imitate stone, there is really not much deception, as the blocks are exactly like one another. Care is required in the manufacture of concrete blocks, a fact which has been brought home of late in the United States, where the cement block industry is large and has been rapidly growing for some years. We hope to be able to find space in a future issue for the publication of some rules and regulations for the manufacture of these blocks which have been drawn up by the American Association of Cement Users. Generally, however, it may be stated that the chief causes of imperfectly manufactured blocks are the use of unclean aggregates, insufficient tamping in the moulds, the use of too dry a mixture, and insufficient curing of the block by constant wetting during induration.

Temperature Cracks.

Insufficient attention has been paid in the past by the majority of designers of reinforced concrete construction to the effects of changes in temperature. The expansion and contraction that occurs is very considerable, and the fact has been thoroughly recognised in connection with plain concrete structures, where expansion joints are often provided. In reinforced concrete, however, the effects of temperature have usually been neglected, because it was thought that the reinforcement was sufficient to take up stresses resulting from this expansion and contraction. In the floors of ordinary buildings, as a rule, trouble does not arise in this direction. It often occurs in connection with concrete roofs, but not sufficient perhaps to have attracted much attention. In constructing monolithic walls of concrete, such as boundary walls, where there are no lateral strains to be resisted, sufficient reinforcements are put in to resist temperature stresses; consequently the attention of designers has not been called to their importance in this respect, and it has not been until reservoirs, water-tanks and bridges have been built in good number that the lessen has begun to be learnt. Very often the amount of reinforcement which is provided to resist the stresses induced by the loading is altogether insufficient to resist temperature stresses. More than one-third per cent. of steel is required for temperature reinforcement alone, and this is a considerable quantity. The effect of temperature stresses has become most serious in the case of elevated water-tanks and in bridges. Many reinforced concrete water-tanks that have been built are now leaking badly. Although the bridges of this material in existence in this country are probably safe, a good few of them have developed cracks which are not only unsightly, but make one feel a little uneasy.

SOME TESTS OF PLAIN AND REINFORCED CONCRETE.

By R. T. Surtees, M. I.Mech.E.

In building operations where concrete is to be largely used, the first question that presents itself is: "Where will a suitable material for the aggregate be obtained?" and it is too often the case that, except to see that it is clean and otherwise suitable in appearance, investigation stops there. In the past, concrete has generally been used in large masses, much heavier than brickwork or masonry, but to carry similar loads, and when used in this manner the margin of safety is usually ample to meet all requirements. With the advent of reinforced concrete, however, a new order of things has arrived, and much more is demanded of the concrete when so used than under former conditions; consequently more care must be exercised in selecting the materials, in properly grading them to prevent voids, in thorough mixing, in careful placing, and in consolidating the mass so as to obtain the most satisfactory results.

Unless the aggregate is known as a material than can be relied upon to make good concrete, it is advisable to have cubes made up, say, 4ins. by 4ins. by 4ins., one set of which may be crushed to destruction at one month, and another set at two or three months after making. A few short bars may also be made and tested when lying horizontally; thus a good idea will be obtained as to what the concrete will stand when loaded under compression, as in columns, and in tension and flexure as in beams and floors.

Tests thus carried out sometimes give surprising results, and may perhaps be the means of preventing disaster. The following is a list from a large number of crushing tests on cubes of cement concrete, made with different aggregates. To be sure that uniformity has been obtained in a building it is advisable that cubes be made up from the batches as the work proceeds):—

Numbers.	Result at One Month, in Tons.	Result at Three Months, in Tons.	Mixture.	Size of Aggregate.	Nature of Aggregate.
1	17.3	20.7	1:2:4	1½" and under	Walney Gravel. Machine Mixed Mixed Crushed and Uncrushed.
2	22.1	25.3	,,	,,	
3	20.6	29.6	,,	,,	
4	27.0	31.2	,,	¾" ,,	,,
5	22.2	30.2	,,	,,	,,
6	27.0	37.8	,,	,,	,,
7	31.5	39.1	,,	,,	,,
8	27.0	37.8	,,	,,	,,
9	10.7	13.5	,,	,,	CrushedGranite, Hand Mixed.
10	12.5	15.1	,,	,,	
11	7.6	8.0	1:3:4	½" ,,	Walney Gravel, Mixed Crushed and Uncrushed, Hand Mixed.
12	6.3	7.8	,,	,,	
13	10.9	11.9	,,	¾" ,,	
14	12.9	13.3	1:1¾:3¼	,,	Firebrick, Hand Mixed.
15	10.1	10.8	,,	,,	Brindle Brick, Hand Mixed.
16	13.3	13.6	,,	,,	Furnace Clinkers, Hand Mixed.
17	13.0	17.6	,,	,,	
18	9.8	17.6	1:2:4	⅜" ,,	Blast Furnace Slag. Hand Mixed.
19	.9	15.0	,,	,,	

Dirty Aggregates.

In Nos. 9 and 10 it will be seen that the strength obtained is very low for the size of the aggregate used, and it came quite unlooked for, as they were made from crushed granite which certainly had the appearance of a suitable material for concrete. Examination proved that it contained an excess of clay and dirt, which was undoubtedly the cause of its poor showing.

It is true that a small quantity of clay, say, up to 10 or 12 per cent., distributed through the mass, may be no detriment to the mixture—in fact, a little more than half the quantities mentioned may be an improvement with certain cements, but on placing some of this particular sample in a glass tube, shaking it well up, and allowing it to stand until settled, it showed almost 30 per cent. of impurities. On tracing it back to its origin, it was found to have been obtained from a part of the quarry where there were numerous beds in the stone full of clay, and being practically the same colour as the granite this material was not easily detected, after passing the crusher, as some of it was in the form of small lumps. Careful washing and grading samples of this aggregate, and again testing, proved that the cubes resisted pressures exactly three times as high.

Clay Nodules mistaken for Stone.

It is always advisable to wash stone that is crushed to pass, say, a 1in. mesh, more particularly if it is of a hard texture, as there is always a large amount of fine dust on the outside of the individual stones which prevents the cement adhering to them, thus causing the concrete to be weaker than it should be.

Concerning aggregates, the following may be an experience not often met with: For an important undertaking a sample of gravel was submitted for the concrete, which had the appearance of being clean and very hard, the pebbles being of fairly uniform size. A handful of this was placed near a steam pipe to see what effect the application of a gentle heat would have, and in a short time it was noticed that a large number of very fine cracks appeared on the surface of each stone, so fine that it required a close inspection to discern them. On breaking the supposed pebbles to pieces it was discovered that they were simply nodules of clay, covered with a thickness of about 1-16in. and more, with a hard skin composed principally of oxide of iron and lime. Needless to say, the sample was quite unfit for use in making concrete.

Size of Aggregate.

In making plain concrete it is, or was, usually the case to specify the stones to be not larger than 2½ins., including all sizes below that which had been made in the breaking. A proportion of clean, coarse, gritty sand was then added, and then the cement. This was mixed by turning over on a clean platform, say, twice, before adding the water, and twice after, and then placed without more ramming than could be done with the shovel. The consequence was, that after setting the concrete usually contained a quantity of honeycombs, and was not of the strength it otherwise would be if care is exercised in grading the aggregate so as to contain proper quantities of the larger and smaller sized stones, to which should be added enough coarse and fine sand with cement to make mortar sufficient to rather more than fill up the interstices.

With aggregates broken by crusher, all less than 1-8in. mesh should be screened out, preferably in washing, and may be afterwards added as sand. The necessity of this screening may appear superfluous, but it is astonishing what a difference there is in the amount of small stuff from different stone. In some, which had been broken to pass a ⅜in. mesh, carefully tested, as much as 28.03 per cent. of this fine stuff was found, whilst in others there was less than half that amount. Some specifications reject this altogether, but when mixed with certain sands it will improve the strength of the concrete.

In reinforced work the usual size for the aggregate is required not to exceed ¾in., and it should always be obtained from good hard stone, such as flint, granite, whinstone, or the like, and where a mixture of half crushed and half uncrushed can be got, the best result under both compressional and tensile stresses will be obtained.

Voids.

It is interesting to note that at one month after making, best results under flexure loads will be got with a crushed aggregate, but at a three months' test the uncrushed will invariably come out better. Whilst it cannot be otherwise than safe to have an aggregate that is quite clear of impurities, it is not always possible to obtain this without considerable expense, and it is of more importance to so manipulate and consolidate the mass, to ensure a thoroughly solid concrete clear of voids, than to be too fastidious in having it clear of certain foreign matter.

Tests made by inserting pieces of steel in blocks of concrete proved this. The blocks were placed out and in water until the projecting ends were lightly corroded. The concretes were made from various aggregates, including blast furnace slag, some of which contained 2.07 per cent. of sulphur, and in every case where the concrete was clear of voids no deleterious action was set up in the steel, but wherever a slight honeycomb existed, more particularly if it communicated from the steel to the exterior of the block, then rust began to form. In several of the tests the cover over the steel was less than ½in. thick, and this provided perfect protection.

Coke Breeze.

Ashes, pan breeze, coke breeze, etc., do not give good results if used alone, although when mixed with a good proportion of sand they can be used under certain conditions, but even at the best there is a large risk attending their use in reinforced concrete. It is practically impossible, with them, to ensure a concrete that will be of uniform strength throughout, as the material crushes in consolidating, and where it has to come in contact with water, particularly salt water, electrolytic action may be set up which will decompose the steel to graphite and render it useless. It has been known for floors to fail under such conditions within eight years of their being laid, and on testing by again embedding steel rods in concrete made from this material it was found that within two years after making the surface of the embedded steel, in contact with the ashes, had softened to such an extent as to allow them to be moved around in the blocks quite easily. Their appearance, on extraction, confirmed this action having commenced. It is well known that water-mains laid in ashes are subject to a similar action, and cases of such have been known, where the cast-iron of which they were composed could be cut with a pocket-knife like a lead pencil within ten years of their being put down.

Practical Mixing.

In mixing concrete it is much better, and for jobs of fair magnitude, cheaper, to do it by machine than by hand, whilst the whole of the concrete will be of more uniform character and strength.

In a number of tests carefully carried out it has been found that the strength of concrete, under compressional loads, at one month and three months after making was 16 per cent. higher than the same components mixed by hand, whilst the

former cost 10d. per cube yard, and the latter 2s. 3d. There are various machines now on the market, one of the best forms being that illustrated in Fig. 1. It consists of a revolving drum, in the interior of which are a number of blades to carry the concrete to the top, when the mixer is in operation; it then falls to the bottom to be again caught in the blades, thus being thoroughly churned together, and with a few revolutions thoroughly mixed. The materials are gauged in the box at the back, whence it passes into the drum, and, after mixing, a hinged spout is swung into the inside, into which the concrete drops, and is shot out into barrows, as seen in the figure, to be conveyed to where it has to be placed.

Bars.

For reinforced concrete, steel bars of various cross-sections are used, some being plain round or square, some distorted, indented, lugged, cupped, etc., and some are cut or sheared to the desired shape and form. Each class has it advocates, but by far the most used in Europe are of plain section.

In the recent report of the Royal Institute of British Architects the allowable resistance to shearing stresses in the concrete is less than the adhesive resistance between the concrete and the steel. This is quite in accordance with tests which have proved that it is not the slipping of the bar in the concrete that yields when a bar can be withdrawn from a mass, but the shearing of the concrete, as a thin layer is found adhering to the bar.

Keeping Steel in Place.

For the success of reinforced concrete it is of paramount importance that the steel should be placed in its proper position, and so fixed that it will not be moved whilst ramming or otherwise consolidating the concrete. It is surprising how easily loose members can be knocked out of place during this process, unless efficient means are taken to prevent it; but in ramming there is often more force used than is necessary, and this depends to a large extent upon the consistency of the concrete. Machine-mixed concrete with sufficient water in it to make it just on

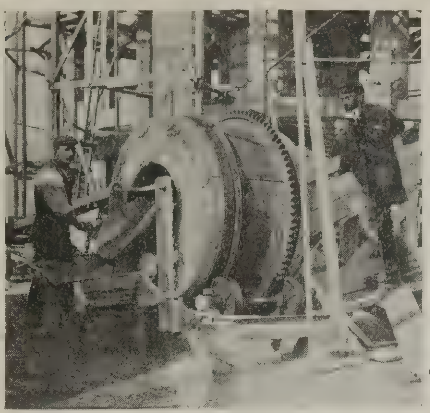


FIG. 1.

the sloppy side of stiff is best for this purpose. If too stiff it requires more consolidating, and if too sloppy the water comes too soon to the top, and may float the cement into layers, when the mass will not be of uniform strength, and if the water is allowed to escape it will carry with it a portion of the matrix, to the detriment of the structure.

FIG. 2.

Columns.

There is perhaps more danger in moving the steel when ramming stiff concrete, as the workmen may force it in between the forms and the bars, thus moving them out of place. This is particularly so with columns, for commencing at the bottom the vertical bars, and often the hooping as well, may be thus forced inwards—away from the timbers, and this moving becomes greater towards half the height and less again at the top, reducing the core most at where it should be strongest. This may be a source of great danger, as the core is the part the designer calculates to take the load, and however little it may be less than intended it will that much reduce the factor of safety of the building. It may be well to mention here that it is doubtful whether many columns existing at the present day will have the steel in its proper position and the core of the full size designed, and in some instances the escape from disaster may have been on account of the superior quality of the concrete, as engineers in this line have been most particular in having the best cement, as well as other materials, and it is undoubtedly in a large measure owing to their demands for a superior article that the quality and fineness of this matrix has so much improved in recent years. It is almost useless to fix the skeleton steelwork by wedging with pieces of stone and such like, as they soon get knocked out, and unless they are secured by proper sockets or fitments at intervals of their length they are very liable to get displaced. In testing columns to destruction it will be seen that after a certain amount of load has been applied they begin to bulge outwards from the centre. As the pressure is increased this bulging becomes greater, as seen in Fig. 2, which shows the completion of the test under a load of 215 tons. It sounds somewhat paradoxical, but is nevertheless near the truth, to say that if the best results are to be obtained under compressional loads the steel must be so designed as to resist the pressure in tension. Of course, this has its limits, but undoubtedly the area of steel as hooping gives a much greater strength than what it would give if placed longitudinally. A good designer varies the two to suit different conditions.

A careful inspection of Fig. 2 and the details of Fig. 4 will prove this, for it is the hooping wires that so much depends on for success, and in resisting the bulging action they are always as tension.

Fig. 3 is a companion column to Fig. 2, made with the same quality and mixture of concrete throughout, but without any steel reinforcement in it. The pair are out of a set of six, and great care was taken to ensure them being identical throughout, as it was desired to gauge the different behaviour of each under similar loadings.

The column illustrated in Fig. 3 failed under a load of 219 tons, a most surprising result, and at failure burst with a loud report, parts of it being thrown a considerable distance. This was 4 tons better than its reinforced companion, and was undoubtedly due to the superior ramming and consolidation of the concrete. In the mould in which it was formed there were no steel rods to obstruct this being efficiently performed; a larger rammer was used without difficulty, which could not be done in amongst the steel skeleton of the other. This is a striking object-lesson, proving the importance of this part of the work, and the advantage of so arranging the steel that it can be built in with as little interference as possible with the consolidation of the concrete. It also shows that there may be a huge difference in results between laboratory tests and practical work, for in the former small members are usually experimented with, in which the steel can be easily fixed, of the correct size and in the proper place, with the concrete manipulated in the best manner, which cannot be done with larger structures.

It is not generally known what an important bearing, apparently, small details have upon the efficiency of this class of work. Take the hoopings and links in Fig. 4, and note how, in the links at each side of 8, the ends are united by allowing them to simply lie side by side in the concrete, the tie being dependent upon the adhesion of the concrete. This is the earliest practice, and when the pressure on a structure built up in such a manner causes it to bulge, the joining yields sooner than it would do if the ends were securely united. Bending the ends into the concrete, as at 7, is no better—in fact,

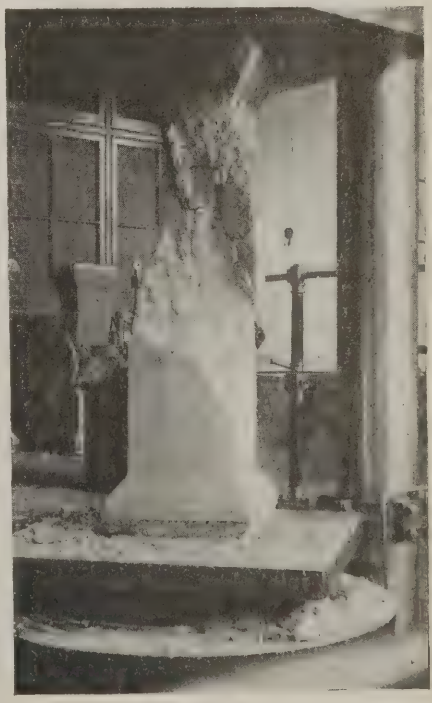


FIG. 3.

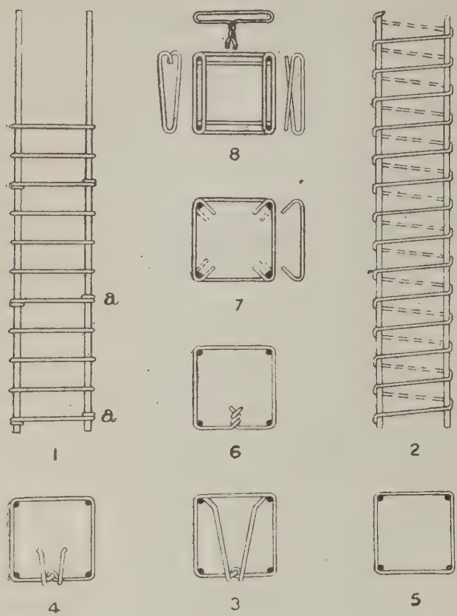


FIG. 4.

they cause rupture in the concrete at a very early stage. 3, 4, 6, and the link at the top of 8 show connections which will not yield before the wire itself breaks, and tests have shown that a structure built with hoopings, securely fastened at the joinings, will be 23 per cent. stronger than those having hoops with the ends of the wires side by side—a very important improvement. Ends twisted together, as at 6, give good results when made from steel of suitable texture and toughness, but if too hard, or if the ends are twisted too tightly, it tends to weaken them, and they have often been known to drop off in the making. In flat hoops the ends may be riveted, but the holes for such always cause a loss of steel, and welding is not reliable.

Varieties of Hooping.

A difference of opinion exists as to the best method of applying the hooping in reinforced concrete, some preferring hoops or bands at regular distances apart, passing around the outer sides of the bars, others employing links from bar to bar, whilst flat plates have been used with holes punched in them and passed over the ends of the bars for use in the same manner as links. A helical winding around the outside of the bars is also much used. On the whole, hoops of wire, as at 1, from 3-16in. upwards in diameter, are perhaps the most efficient in practical work. They are simple to make and they are built into position in the forms, as the concrete is being placed, thus offering no obstruction to the rammers; the whole of the steel, except the ends of the ties—and they can be made to act as bonds, as shown at 3—is around the outside of the core (its best position), and any number can be used to get the required strength. Links and plates have both given successful results, although only one side of the link will be on the outer side of the core, and the other a short distance into it, and for once around a square column there will be four ties, where there would only be one in a hoop. They are almost as easy to get into place, and can also be built in as the work proceeds, offering no obstruction to the rammers. Plates are more stubborn to deal with; they tend to encourage planes of cleavage and are now seldom used.

Spiral Reinforcement.

Excellent results have been found in laboratory tests with helical winding, but it is very doubtful whether the same is obtained in practical working. The ease with which small members of this design can be made favour the former results, but the difficulties in actual work are more numerous. In, say, a 12ft. column the vertical bars will be helically wound with wire along their full length, as seen at 2, at a suitable pitch, forming a steel cage, the ends of the wire being several times made to unite, and should one of these ties be imperfect, or should a dent or kink be formed in the wire, or should it get otherwise damaged, the whole length of structure will be correspondingly weakened. This cage is then placed inside the timber form, and the concrete is dropped in from the top. It is impossible to see down to the bottom, and unless the concrete is of a very sloppy consistency it is difficult to get it around all the steel members, as ramming is out of the question, particularly in columns of small size, and the probability is that honeycombs will be found in the mass. In piles or in structures made horizontally, the difficulties connected with the placing and tamping of the concrete do not apply to anything like the same extent, and under such conditions very good results may be obtained. Where the helical winding can be sectionised and built up with the concreting in a similar manner to that of hoops, then better results will follow, but care must be exercised to efficiently secure the ends of the individual sections. It is, no doubt, a good system for short members, or where it can be properly applied, and its virtue may be in the fact that there is no really horizontal plane of concrete, across section, in its length, as there is between two hoops. In hooped members of large size, or where a small-sized member has to carry a heavy load, it is sometimes an advantage to assist the hooping by placing steel rods through the core, and where this can be done, in secure combination, the best results will follow. At 3 is seen such a unity, where the ends of the hoops, after being securely united, form arms, which pass through the core, in the plane between the hoops. Each alternate hoop has these bonds laid through the core in a different direction to those of the preceding one, thus bonding it in every direction, and each joining will have the hoops above and below it, having their joinings in a different side, and obtaining further security. At *a* in 1 are seen encircling fitments, which embrace the bars, preventing them getting forced too far apart, or too near together, and ensuring the core being of the size required.

Comparison between Helical Winding and Wire Hoops.

Fig. 5 is a test column of a helically wound column, 8ins. square, which failed under a load of 52 tons, and Fig. 6 is one made with hoops and bonds, as last described, which failed under a load of 93.5 tons, being from a set of four, made with the same weight of steel and the same mixture of concrete throughout. Speaking generally, on wire hoops and helical windings the tests have indicated that in square columns of short lengths there will be little difference between a helically-wound specimen and a wire hooped one, provided both are applied at the same pitch, and the same strength of wire is used. The former may be more successful in columns of circular section, and there will be a little steel lost at the connection or ties of the latter, whilst the greater simplicity and accuracy in application will perhaps more than counterbalance this.

Beams.

In structural members, subject to bending, or flexure, such as beams and floors, it is usual to place about 1 per cent. of steel in the lower or tension side, and to rely upon the concrete above the neutral axis to resist the compressional stresses.

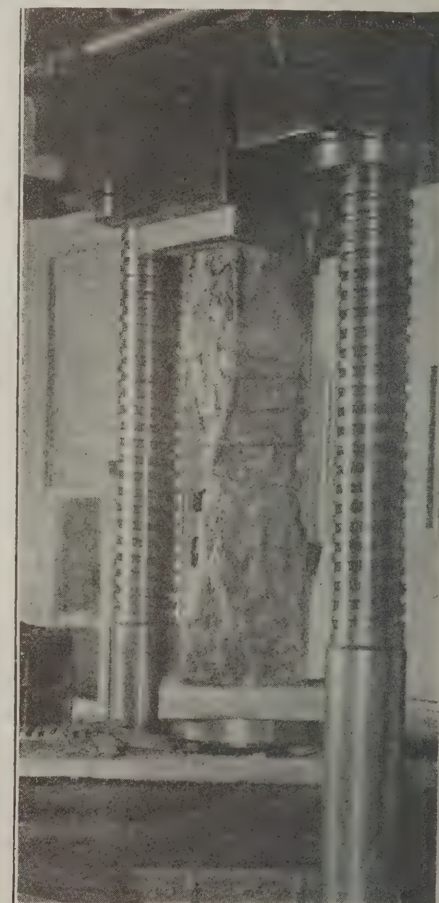


FIG. 5.

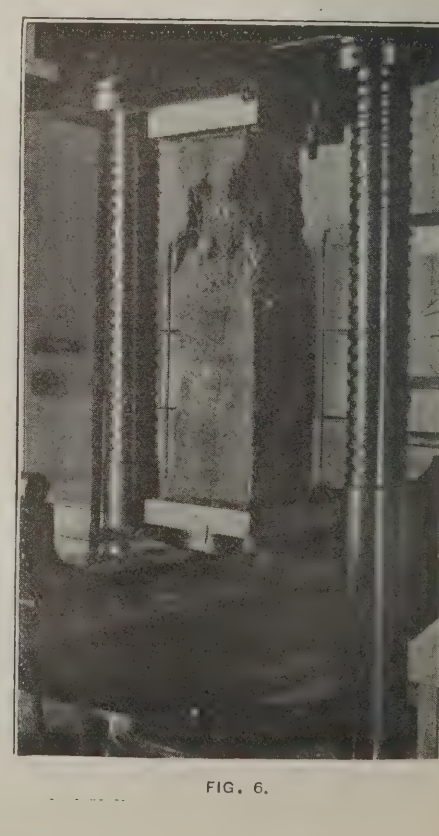


FIG. 6.

This is common practice, and usually economical for beams of spans up to about 20ft. which have not to carry exceptional loads. Instances, however, are daily met with where this does not apply for beams which have to carry heavy loads over a considerable span. In such instances the depth of beam required, and its own weight, may make it impracticable, and the case is often met by placing bars in the compressional area, to assist the concrete to take the load. To use simple bars there is not good practice for heavy stresses, as their strength can only be up to the buckling point, and the full compressional strength of the steel will not be developed. A great help to these bars is to use on them a good number of stirrups, or otherwise brace them to resist this buckling action. In large beams it is more efficient, and cheaper, to hoop part of the compressional area, when its safe resistance can be increased to more than 1,000 lbs. per sq. in. This means that the beams may be of much smaller cross-section, with less dead weight to provide for, and as the hooping is laid horizontally it is easy to fix and maintain in position.

In addition to the tensional and compressional stresses in beams, more particularly under distributed loading, there are the shear stresses to be provided for, and in regard to this there is a vast difference in practice. Flat stirrups bent over three-quarters around the main bars, so that they would not easily leave them in making the beam, yet not so securely attached to them as to prevent slipping, were patented in Great Britain in 1892. Other forms of flat stirrups are in use, both loose and attached, and recent investigations seem to indicate that there may be some danger of rust forming where two large surfaces of steel are laid together in concrete, but this is not the writer's actual experience of steel embedded in good concrete. They are useful under certain conditions, and there is no doubt that a large amount of good work has been turned out wherein they have been used. Single flat bars with one end turned around the tension members are also in use.

Wire stirrups and trussings of various forms are common, both loose and attached to the main bars, whilst special bars with shear members formed on them, and special bars slotted and with wires fitting into them are of recent introduction. All have their particular adaptations and advocates.

Attached Shear Members.

Recent tests have thrown considerable light upon the use of these shear members, and only those who have made careful and accurate investigations can fully realise the great difference in results that will be obtained from the use of the same weight of steel under the different applications. There is no doubt, in the writer's mind, that a shear member, securely attached—not merely wired on—to the main bars, and lying at an angle of 45degs., will give vastly superior results to loose shear members, at whatever angle they may be laid.

Round rods encircling the main bars in such a way that the consolidating of the concrete tends to tighten their hold seem to meet this object efficiently.

Tests on Beams.

Fig. 7. shows a rectangular beam tested with a concentrated load, one of a set of six, made identically throughout, but one-half the number having attached shear members, and the other loose, the result of the experiment proving the former to make bars 11.54 per cent. stronger than the latter. It will be noted in the specimen that the failure is partly in the compressional area.

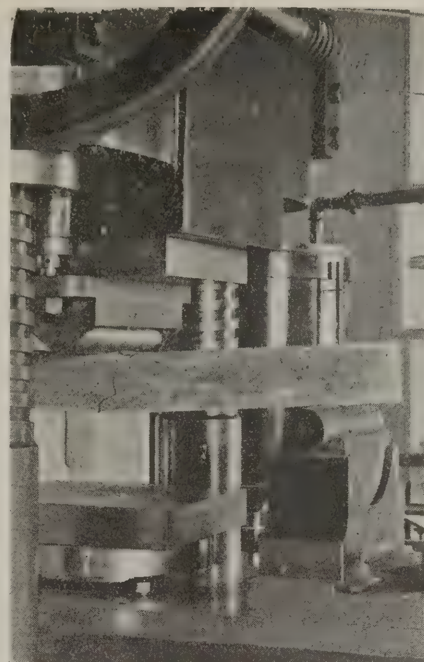


FIG. 7.

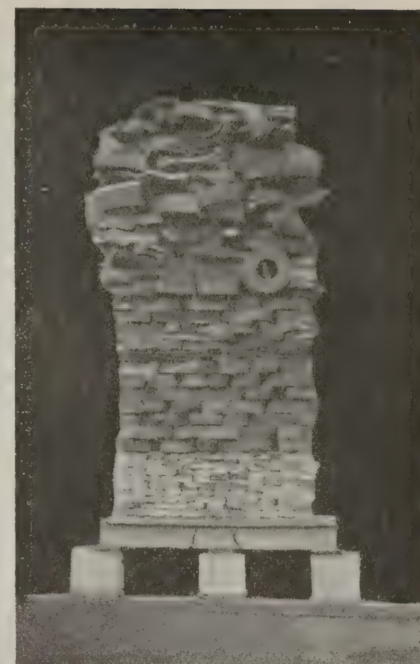


FIG. 8.

Fig. 8. illustrates the testing of one of four T beams made on exactly similar lines, but loaded with ends supported, the result being 52.3 per cent. in favour of attached shear members.

Fig. 9. shows similar beams, but with ends as semi-built in, or loaded over all, where the attached members proved 47.47 per cent. the stronger. In all the above the load taken was at first crack. The beams were 12ft. span, with 9in. by 5in. ribs under a 4in. slab 30ins. wide, with two ¾in. bars in the tension side, one straight and one bent up. Loose members at right angles were used in one, and in the other they were looped round the bottom bar, and laid at an angle of 45 degrees.

Fig. 10 is a diagram of curves of some of the tests. Nos. 1 and 3 were made with securely attached shear members, and Nos. 2 and 4 had them loose. No. 4 had the least deflection after the commencement of the loading, probably indicating it to be a little better made, but it afterwards soon gave, the shear members evidently allowing the concrete to slide on the tension bar to failure, after the concrete was ruptured. No. 3 was accidentally overturned in loading, but it shows that the stresses are much better distributed along the beam, making it more elastic. No. 4 shows that after the first crack there has been little slipping, the steel in tension ultimately tearing asunder gradually. No. 1 has carried its initial deflection almost as high as No. 3, and higher than the other two. The stresses have been again very well carried along the beam, which was not tested to destruction, owing to want of loading material. It will be noted

IG. 9.

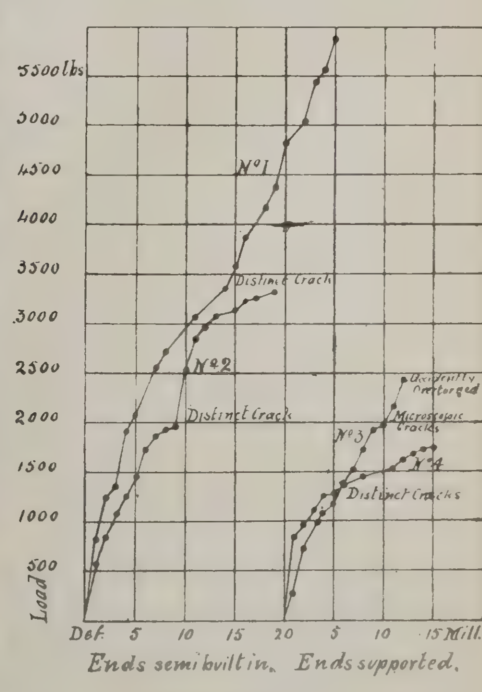


FIG. 10.

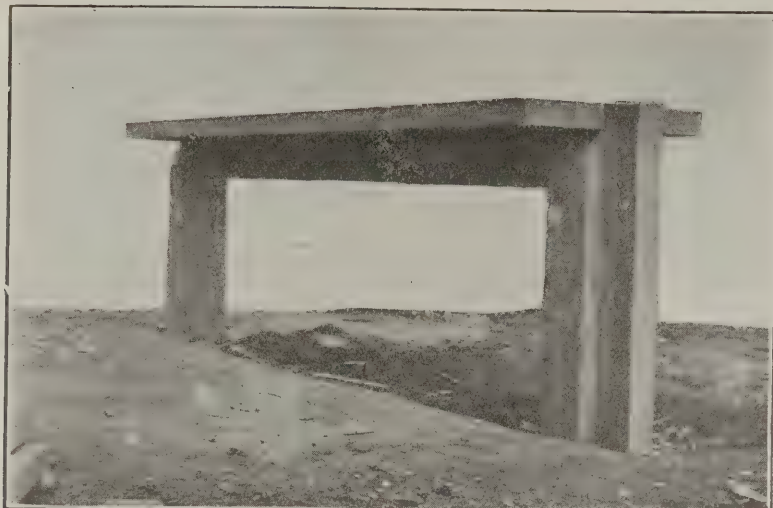


FIG. 11.

FIG. 12.

that the attached shear members seem to distribute the stresses along the beam more evenly, enabling it to stand a greater deflection, indicating that both concrete and steel are stretching together. The examination for cracks was made with a powerful magnifying glass, attention being paid to the deflection gauge at the same time.

Fig. 11 illustrates a beam before testing. Fig. 12 illustrates it under a load of ten tons and no permanent set, this specimen being made with shear members secured to the main tension bars. Fig. 13. is after a test on a beam made with loose shear members.

Beams insufficiently reinforced against shear, and tested to destruction under a distributed load, fail near the supports, and this will occur sooner with loose shear members than with them securely attached to the tension bars. Should these members be placed too far apart, cracks will first appear near the attachments, but when the shearing stresses are efficiently provided for, the failure will be near the centre of the span or point of greatest bending moment.

Fig. 14 is a floor slab having a clear span of 5ft. with an effective depth of 4ins., the amount of steel in tension being 0.2 per cent., and the shear members securely attached to the tension members; the load illustrated was 17.34 cwts. per ft. super. On close inspection it will be seen that the pillar supporting the left-hand end of the slab has sunk down, adding to the severity of the test. The companion

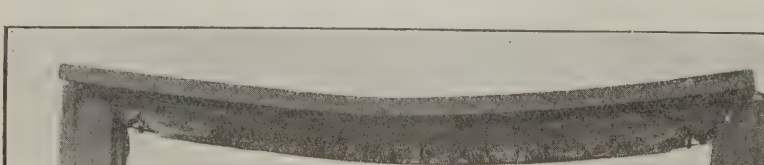


FIG. 13.

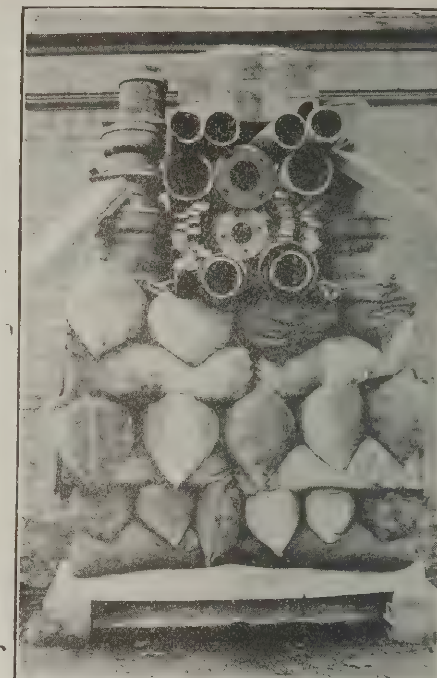


FIG. 14.

slab to this, with loose shear members, failed under a load of 9.34 cwts. per ft. super.

In the above loadings care was taken to prevent arching, and the blocks of lead directly on top of the beams effectually distributed the load and prevented fracture of the concrete.

The attached shear members used were of light round rods looped around the tension bars (patented), laid at an angle of 45 degs. and reaching right up to near the top of the specimens.

Advance in use of Reinforced Concrete.

The last year has been noted for the great increase of buildings constructed of reinforced concrete, which undoubtedly has a great future before it. Its successful introduction, however, has been a work of great effort and tact, as the conservatism and prejudice of both the architectural and engineering professions have had to be overcome, and in no other profession is this more difficult to combat.

The Patent Office records give many systems, there being more than 100 patents taken out in connection with reinforced concrete, yet it is surprising how few of them have made much headway—indicating that the patentees must either have had little confidence in their productions, or have given up as hopeless the task of getting them under way. It is therefore all the more creditable to pioneers who have realised the value of their inventions, and have striven to make them not only successful for themselves, but have opened a way along which others of lesser might could follow.

The committee appointed by the Royal Institute of British Architects, whose report was issued last summer, has put an official acceptance upon this method of construction, which will, no doubt, be the means of giving confidence to those who have not had the opportunity of investigating its merits.

The technical press are also fully alive to its field of operations, and have recently done excellent service in advancing its progress, whilst architects and engineers are having it brought so fully to their notice that they are now beginning to realise it is imperative for their personal success that they should take it up.

THE USE OF REINFORCED CONCRETE IN ENGINEERING & ARCHITECTURAL CONSTRUCTION IN AMERICA.*

By Ernest R. Matthews,
Assoc.M.Inst.C E., F.R.S.E., Borough Engineer of Bridlington.

Reinforced concrete has been more extensively used in engineering and architectural constructions in the United States of America than in any other country. Its extensive use has been due to the fact that its strength, rigidity, durability, and fire-resisting properties have proved to be unsurpassed by any other material. Added to these good qualities is the fact that it is an economical material to use; and last, but not least, is the rapidity with which works can be executed where this material is employed.

It is the author's opinion that we are fast approaching the time when, as in America, so in this country, reinforced concrete will be the chief material used in all engineering and architectural constructions, and it is because of the increasing use of this material that he has put himself in communication with a large number of engineers in America, who have kindly supplied him with a great amount of valuable information on this important subject.

Municipal Engineering Works.

Under this heading the author proposes to deal with the use of reinforced concrete in the construction of waterworks, sewers, and sewage disposal works.

Reservoir Construction.

In a paper which the author had the honour of reading before the Society of Engineers in May last on "Waterworks Construction in America," he pointed out that many of the most modern covered service reservoirs in that country were constructed throughout of reinforced concrete, while others were built partially of this material. As an example of the latter he referred to the covered reservoir at Rockford, Illinois, U.S.A., a brief description of which is as follows:—The arched roof is constructed of reinforced concrete. The reservoir is 156 ft. by 66 ft. in size, and the roof consists of a ribbed arch; the ribs, which are placed 7 ft. apart, increase in depth from crown to haunches. The concrete used was 1 : 2 : 5, and the soffits were rendered over with cement mortar, composed of 1 Portland cement to $2\frac{1}{2}$ sand. The reservoir cost £3,778, the roof costing £408.

The roof of the covered reservoir at Louisville is also of reinforced concrete; this is one of the finest modern American covered reservoirs, and has a capacity of 25,000,000 gallons, the water covered being 154,739 ft. super. The cost per square foot for covering this reservoir was 2s. 6d.

The advantages of using reinforced concrete for reservoirs are—lighter (and, therefore, more economical) construction; cost of maintenance practically nil; rapidity of execution; hygienic value; saving of space; reservoir increases in strength with age; no joints.

Aqueducts and Conduits.

The same advantages apply equally to aqueducts and conduits. In a paper entitled "Reinforced Concrete Sewers and Conduits in the United States of America," presented to the Institution of Civil Engineers in 1906, the author dealt fully with this subject, and showed that there was a growing tendency in America to construct all aqueducts and conduits of reinforced concrete. He pointed out that

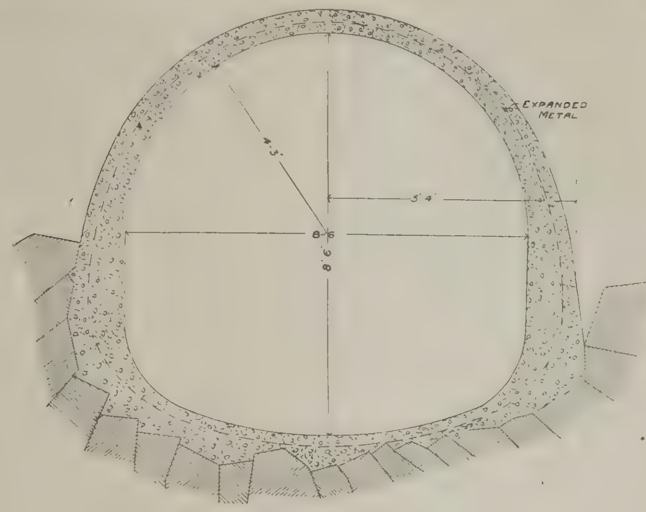


FIG. 1. SECTION OF REINFORCED CONCRETE WATER-SUPPLY CONDUIT FOR JERSEY CITY.

the most important modern conduit in America, namely, the conduit built in 1903 in connection with the new water supply of Jersey City, was constructed of this material; it was elliptical in cross-section, 8 ft. 6 ins. by 8 ft. 6 ins. in size, and nearly 4 miles in length. (Fig. 1.)

Water Mains.

The application of reinforced concrete to high-pressure water mains would have been thought a few years ago to have been a thing impossible, but so satisfactory has this material proved for this purpose, that there is every likelihood of it being used very considerably in the future. Much has to be said in its favour. The corrosion of the ordinary cast-iron water main and steel tubes is a serious matter, but in a reinforced concrete water main no corrosion can take place, hence the life of the pipes is very much longer. The joints in the reinforced concrete mains can be made equally as strong, if not stronger, than in the ordinary cast-iron mains. Most of the reinforced concrete water mains in America are of the "Bonna" type.

Quite recently a reinforced concrete water main, also of the "Bonna" type, has been laid for the Swansea Corporation under the superintendence of the Waterworks Engineer, Mr. R. H. Wyrill, M.Inst.C.E., and this has stood admirably the severe tests to which it has been subjected.

This main is designed for a working pressure equal to 185 ft. head, but the pipes, which were taken at random and tested in a proving press, Mr. Wyrill says, stood a pressure equal to 450 ft. head. The main has since its completion been tested up to a head of 382 ft., or over twice its ordinary working pressure. This work has been executed by an American firm of contractors.

The author understands that this is the first example of a reinforced concrete water main having been laid in this country, but there is every reason to believe that it will shortly be followed by other examples; in fact, a similar main is now being laid for the Norwich Corporation under the superintendence of the City Engineer, Mr. A. E. Collins, M.Inst.C.E.

Dams.

Several low-buttressed dams formed of reinforced concrete have been constructed in America. One of the most notable of these is the concrete steel dam at Theresa, New York. This is reinforced with Thacher rods and expanded metal. It is 120 ft. long and 11 ft. high.

Fig. 2 illustrates an economical design which American engineers have recommended for a dam of this class. It will be noticed that in this design reinforced concrete beams of uniform cross-section but unequal spacing (owing to the greater pressure being exerted on the lower part of the dam) are introduced. The floor of this dam is of reinforced concrete only 4 ins. in thickness.

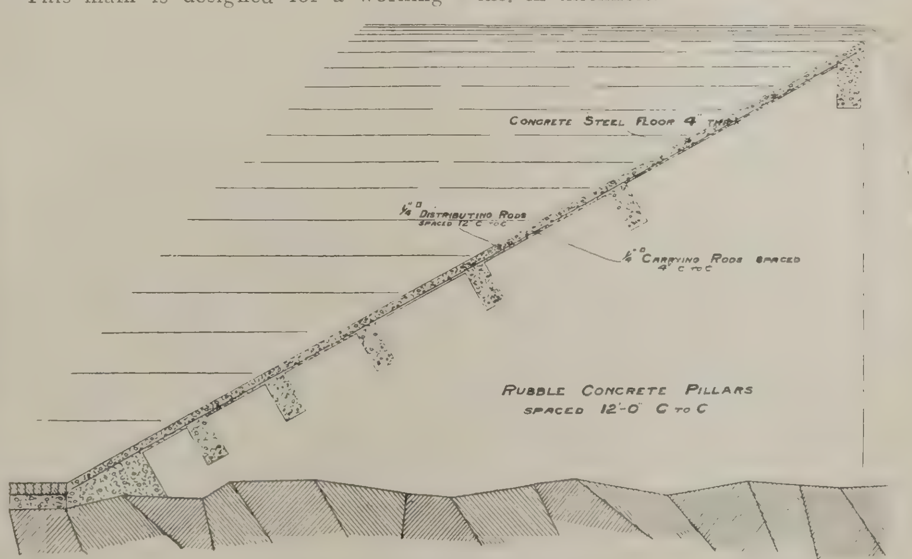


FIG. 2. A REINFORCED CONCRETE DAM.

*Abstract of a paper read before the Royal Society of Arts on March 11th, 1908.

Sewers.

For the construction of large sewers the author does not know of a more suitable material than reinforced concrete, and most of the modern sewers in America are constructed of this material. As one example may be mentioned a sewer of horse-shoe section constructed for the Lancaster, Pa., City Council. This sewer was designed by Mr. S. M. Gray, and is reinforced with expanded metal of No. 10 gauge and 3 in. mesh.

Sewage Disposal Works.

In sewage disposal works reinforced concrete has been used very largely in America. For settling tanks, sewage reservoirs, and similar works, it has been found to be the best and cheapest material to use, the same advantages already enumerated for its use in reservoirs being applicable in this case also. Not only so, but as most of these works in America are constructed circular in plan, they are more easily constructed in concrete than in any other material.

Bridge Construction.

American engineers have long since realised how eminently suitable reinforced concrete is for this purpose, and have, therefore, employed it very largely in all classes of bridge construction. Many others, while not constructing the entire structure in reinforced concrete, have used it extensively in foundations, floors, piers and parapet and spandril walls of bridges, while some have used it only for the arch ring.

Objection has been made by some engineers to the use of this material in the entire bridge on the grounds that a graceful structure cannot be erected if stone, brick, or steel, or a combination of some or all of these materials, is not used. And the author is bound to agree that some of the earlier reinforced concrete bridges were strikingly plain and inartistic; nevertheless, this objection can now be dispensed with, as great improvements have been made in this direction, some of the more modern bridges of this type being very artistic in design.

The type of concrete-steel bridge which is most common in the United States is the arch type. Lightness in design and cheapness are the two chief recommendations of this bridge, while very long spans are obtained owing to the strength of this material. In Europe girder bridges of concrete-steel have been erected, but American engineers do not as a rule favour this type of construction. Reinforced concrete is also largely used in America in the construction of highway bridges and culverts.

And an example of its use in bridge construction, the author describes a highway bridge which has just been completed at Indiana, U.S.A. (Fig. 3).

The construction of this bridge was commenced in August, 1904. It spans the principal street on the east side of St. Joseph River. The design of the bridge is an elliptical arch formed of reinforced concrete, the reinforcement consisting of steel latticed ribs. The roadway of the bridge is 52 ft. in width, the footways being each 10 ft. wide. There are two electric-car tracks on the bridge. It is a skew bridge, and cost 119,000 dollars (£23,800), the cost of piling being extra. The piers and abutments are carried down into the clay, and about 2 ft. of piling projects up into the concrete. The longitudinal ribs are joined together by steel bars at the top and bottom chords of the steel arches, spaced a distance of 10 ft. apart. The arches are plastered on top,

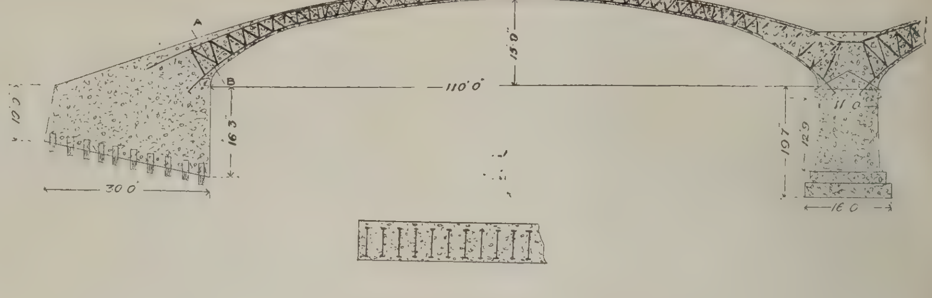


FIG. 3. REINFORCED CONCRETE BRIDGE OVER JEFFERSON STREET, INDIANA.

and then coated with pitch. The concrete used in foundations was in the proportion of $8\frac{1}{2}$ to 1, that in the spandrel walls $7\frac{1}{2}$ to 1, while that in the arch was 5 to 1. The bridge is faced with 1 in. of cement mortar, which was applied immediately after the concrete had been laid. The bridge was designed by Mr. A. J. Hammond, A.Am.Soc.C.E., who also supervised its construction.

One of the most important highway bridges constructed throughout of reinforced concrete is that which has just been completed and which spans the Hudson River at Sandy Hill, New York. This was designed by Professor William H. Burr. The total length of the bridge is 1,025ft., and the width 35ft. 8ins. It has 15 arch spans, each 60 ft. in the clear. The piers are 6 ft. thick at top, and 9 ft. thick 13 ft. below the springing. The bridge was commenced in May, 1906, and completed in January, 1907. It has been fully described by Professor Burr in a paper which recently appeared in the "Proceedings" of the American Society of Civil Engineers (Vol. 33, p. 394).

Railway Sleepers.

The latest application of reinforced concrete to engineering work is its use in connection with the making of railway sleepers, for which purpose it is considered exceedingly satisfactory, its life being so very much longer than that of the ordinary timber sleeper which has been hitherto used.

Tunnels.

Reinforced concrete has been used to very great advantage in America in connection with the construction of tunnels. One of the best-known examples is the Aspen Tunnel on the Union Pacific R.R. This was constructed in 1901. It is 5,900 ft. in length, and the excavation was through rock, a portion of which, 713 ft., was found to be very unstable, and in this length reinforced concrete was introduced in the construction of the tunnel. The reinforcement consists of T beam ribs 12 ins. in depth spaced 12 ins. to 24 ins. apart. The weight of the ribs was 25 lbs.

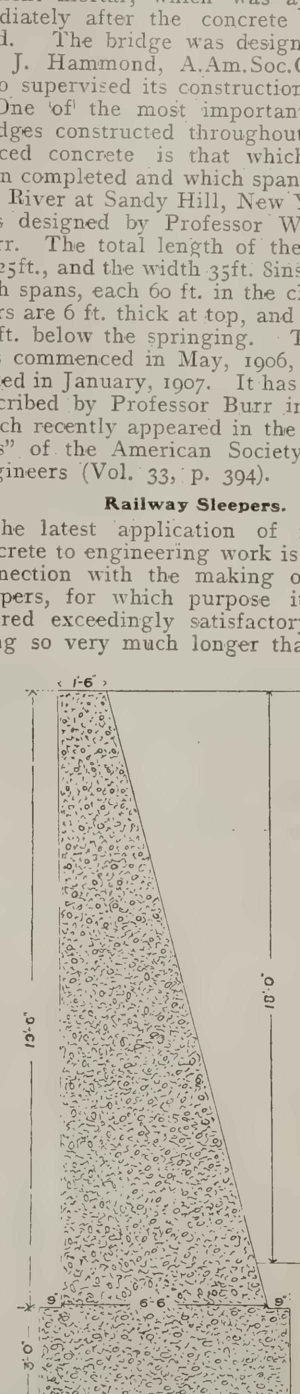


FIG. 4. CROSS-SECTION OF CONCRETE RETAINING WALL, BRITISH DESIGN.

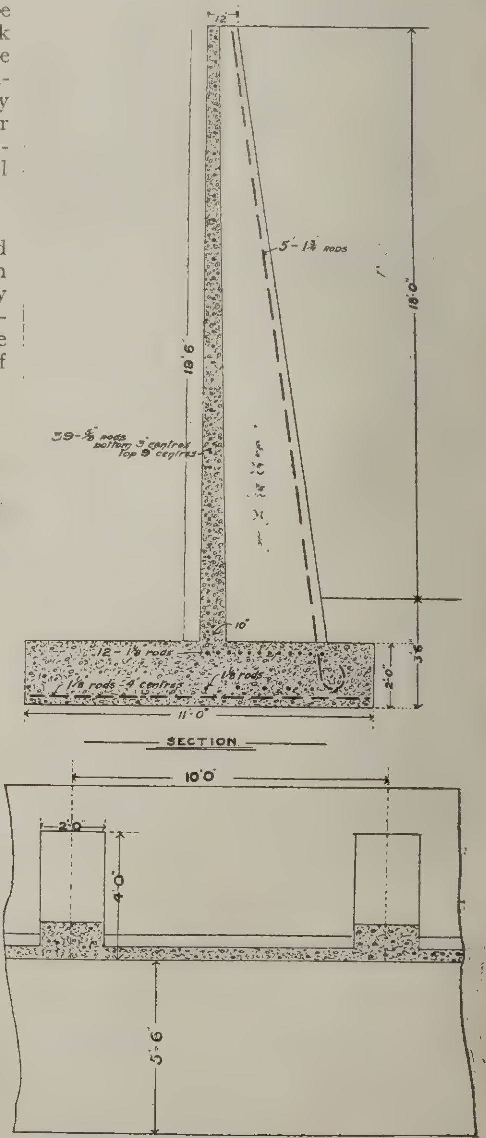


FIG. 5. REINFORCED CONCRETE RETAINING WALL, AMERICAN DESIGN.

per ft. They are connected together by means of riveted fishplates, and cast-iron shoes are fixed at the ends of the ribs. The concrete used was in the proportion 1 : 3 : 6.

Retaining Walls.

The author has already referred to the suitability of reinforced concrete for the construction of reservoir walls; the same advantages apply to retaining walls generally, for which purpose this material has been extensively used in America, and is admirably suited. Its chief advantages for work of this kind are :—

(1). It is more economical, owing to the lighter section of wall which it is possible to adopt; a wall constructed of reinforced concrete has only about one-half of the material in it that a retaining wall of the usual design has.

(2). It occupies much less space for the before-named reason.

Fig. 4 shows a cross-section through a retaining wall, 19 ft. 6 ins. in height, of the usual British design, and Fig. 5 shows a retaining wall of the same height, but constructed of reinforced concrete on the American principle. The reinforcement of the wall between the counterforts consists of ⅝ in. rods spaced horizontally about 1 in. to 1½ ins. inside the face of the wall, and about 9 ins. centre to centre at the top of the wall, and 3 ins. centre to centre at the bottom. 1⅛ in. rods form the reinforcement of the base. The material required to construct 10 lin. ft. of this wall with counterforts is 15.11 cub. yds. of concrete, while the material necessary to build 10 lin. ft. of the British type of retaining wall shown in Fig. 4 would be 37.77 cub. yds., the difference being 22.66 cub. yds. To add to the former wall there is, of course, the reinforcement, which in the 10 ft. length of wall referred to would be 2,691 lbs. of rods.

Wharfs, Quays, and Jetties.

Many examples might be given of the use of reinforced concrete in the construction of wharfs, quays, and jetties in America. This material is largely used for foundation piles, and very often for sheet piles also, which are driven between the main piles. It is also used in constructing the decking beams and slabs. For all these purposes its value is becoming more fully realised.

Reinforced Concrete Piles.

Timber piles for use in tidal waters are fast becoming a thing of the past. The timber being subject to alternations of damp and dryness, lasts only a short time, and in waters infested with teredo it is a well-known fact that timber piles are altogether unsuitable. Cast-iron screw piles are also unsatisfactory, owing to the rapid corrosion of the metal.

In this country concrete-steel piles are now being used in the construction of groynes, for which purpose they are admirably suited. Messrs. Owens and Case are the patentees of these groynes, and they are likely to be used very largely in the future. The Americans have not yet, however, used this material for this purpose.

Protection of Old Wooden and Iron Piles.

Not only has reinforced concrete been largely used in the United States for new piles, but also in the protection and strengthening of old, and this applies to both old wooden and iron piles. It has been found to be a valuable material for a purpose of this kind. To remove and replace with new ones timber piles which are becoming decayed and worm-eaten, or iron piles which are much corroded, is a serious expense; but by the use of reinforced concrete these piles can be strengthened without being removed. This has been done in a variety of ways, but the best-known method is similar to that adopted by Cubitt's Concrete Construction Co., which consists of casing the piles with concrete-steel slabs (see Fig. 6), and pouring inside the casing liquid grout. Some valuable work of this kind has been recently executed, by the firm named, at Southampton.

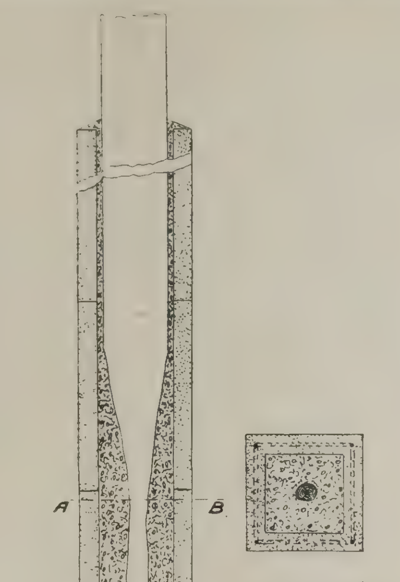


FIG. 6. SECTION OF OLD PILE ENCASED WITH REINFORCED CONCRETE.

The method adopted by the State Harbour Commission, San Francisco, Cal., for protecting the timber piles of one of their piers which is in teredo-infested waters is shown in Fig. 7. The piles here are driven in groups of three. Wooden cylinders, formed of 3 in. sheet piles, were placed around each of these groups of piles, and driven 10 to 12 ft. into the mud. The bottom of the cylinders were then sealed, and the mud pumped out. A cylinder of No. 16 gauge expanded metal was then put in position just 6 ins. inside the timber casing, and the remaining space was filled with concrete, thus forming a reinforced concrete pier. The wooden cylinder has been allowed to remain, but in time will be eaten away by the teredo.

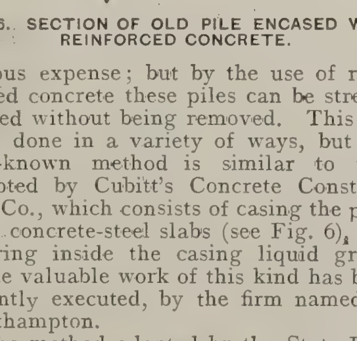


FIG. 7. CROSS-SECTION OF CASED PILES, SAN FRANCISCO HARBOUR.

Reinforced Concrete Buildings.

There are as yet few buildings in this country that are constructed entirely of reinforced concrete, but in America many such may be seen. For example, the largest reinforced concrete building in the world is the Marlborough Blenheim Hotel, at Atlantic City, N.J. This building, erected on the Kahn system of reinforcement combined with fire-proof hollow tiles, is 560 ft. in length and 125 ft. in width, the front wing of the building being 15 storeys high and the remainder 9 storeys. As an exhibition of rapid construction it is unsurpassed. The contract was signed in June, 1905, and the building was completed in eight months, including the decoration. It was erected by the National Fireproofing Co., of New York, the architects being Messrs. Price and McLanahan, of Philadelphia.

Foundations.

The author has proved from experience that where the foundations of a building are upon bad or doubtful ground reinforced concrete is eminently suitable. In America it is used most extensively in foundation work, and one or two examples of its use for purposes of this kind are given. Its use in foundation work will be dealt with under two headings :—

1. Spread Foundations.
2. Piled Foundations.

(1.) *Spread Foundations.*—The foundations of Sprecles Building, San Francisco, which is a 19-storey building, were formed of reinforced concrete as follows : — A continuous I beam grillage was formed, the beams being 15 ins. in section, and weighing 41 lbs. per lin. ft. The area of the foundations was 102 ft. by 98 ft. 2 ft. of plain concrete was first put in, and upon this were set 15 in. beams. These were spliced end to end to a length of 96 ft. These having been put in position, the spaces between the beams were filled with concrete up to the level of the top of the beams; another layer of 15 in. beams laid at right angles to these was then set on top of the first layer, these being spliced similarly to the first ones, and the spaces being filled in with concrete as before.

There are in America many other methods of using reinforced concrete in spread foundations. Expanded metal and bar reinforcement are largely used for this purpose, but space will not permit of these being dealt with in this paper.

(2.) *Piled Foundations with Reinforced Concrete Caps.*—Where piling in America is necessary, owing to the bad foundations met with, the piles used are often of timber (usually spruce), the heads of the piles being embedded in reinforced concrete, but the most up-to-date method of construction is to drive reinforced concrete piles, and form the caps of the same material. The foundations of many tall

buildings have been formed in this way, and it is undoubtedly the correct form of construction, its advantages being so clearly recognised that they need not be detailed.

The two principal forms of concrete-steel piles used in America are the "Simplex" and "Raymond" piles. The former,

FIG. 8. "SIMPLEX" PILE.

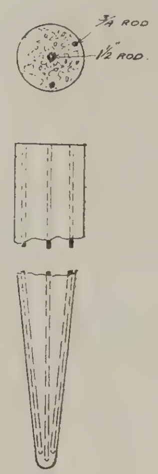


FIG. 9. "RAYMOND" PILE.

shown in Fig. 8, is the invention of the Simplex Concrete Piling Co., of Philadelphia, Pa.; the latter, shown in Fig. 9, was invented in 1901 by the Raymond Concrete Pile Co., of Chicago, Ill. Both of these piles are built in place. The "Simplex" pile is reinforced by a circumferential cylinder of expanded metal of 3 in. mesh, and 5-16 in. thickness. This form of pile was used in the foundations of the Engineering School at Washington Barracks, Columbia, the piles being of 17 ins. diameter and 35 ft. in length. The "Raymond" pile is reinforced by three $\frac{3}{4}$ inch rods and one $1\frac{1}{2}$ in. rod, as shown in the illustration.

Reinforced concrete sheet piles are also largely used in America, and these form a watertight barrier, capable of resisting any required pressure.

Walls.

Reinforced concrete for the construction of walls of buildings in America has hitherto been confined, with a few exceptions, to what might be termed "low" buildings. Its use, however, in the near future in the construction of "tall" buildings is a certainty.

The regulations (1906) of the City of Buffalo specify that the thickness of the reinforced concrete walls of a building shall be as follows:—Where there is a basement: If one storey, 8 ins.; if two storeys, 10 ins.; if three storeys, 12 ins. Where there is no basement:—If one storey, 6 ins.; if two storeys, 6 and 6 ins.; if three storeys, 8, 6 and 6 ins.

What an improvement is therefore effected in respect to additional space obtained by using reinforced concrete. Assuming, for example, that a warehouse is 70 ft. in length, 33 ft. in width, and has three storeys, each of which is 12 ft. in height: no basement. The thickness of the walls, if of reinforced concrete, would be:—

First storey 8 ins.,
Second 6 ins.,
Third 6 ins.,

but if the walls were built of brick, then, taking, say, the city of Birmingham regulations as being a fair example of our British regulations, these being up-to-date, the thickness of the longitudinal walls of the warehouse under consideration would be as follows:—

First storey $22\frac{1}{2}$ ins. thick,
Second storey 18 ins. thick,
Third storey $13\frac{1}{2}$ ins. thick,

while the thickness of end walls would be:—

First storey 18 ins. thick.
Second storey 18 ins. thick,
Third storey $13\frac{1}{2}$ ins.

By using reinforced concrete, under the American building regulations, there would be an increase of floor area on the ground floor of 227.48 ft. super., made up as follows:—Floor area, with reinforced concrete walls, 71 ft. 8 ins. by 35 ft. 5 ins. = 2537.48. Floor area, with brick walls, 70 ft. by 33 ft. = 2310.00. Increase of floor area on ground floor, 227.48 ft. super. An increase of floor area would occur on the first floor of 211.5 ft. super., as follows:—Floor area, with reinforced concrete walls, 72 ft. by 35 ft. 9ins. = 2574.00. Floor area, with brick walls, 70 ft. by 33 ft. 9 ins., 2362.50. Increase of floor area on first floor, 211.50 ft. super. On the second floor there would be a saving in floor area of 133.13 ft. super. Floor area, with reinforced concrete walls, 72 ft. by 35 ft. 9 ins. = 2574.00. Floor area, with brick walls, 70 ft. 9 ins. by 34 ft. 6 ins., 2440.87, a difference of 133.13. So that the total floor area saved by building the walls of reinforced concrete instead of brick would be 572 ft. super.

Floors.

Reinforced concrete has been used most extensively in America for the construction of floors, more particularly in warehouses, factories, hotels, and buildings of the heavier class, and it is admirably suited for this purpose, especially where a floor is subjected to vibrations of machinery.

Many forms of concrete-steel floor construction are in vogue in the United States; these might be dealt with under three classes:—

(1.) *Arches with Flat Top.*—This is a common form of construction. Expanded metal is inserted in the arches.

(2.) *Slab Floor.*—This is another application of expanded metal to floor construction, and is adopted very largely; the slabs rest on girders, and the reinforcement is inserted on the under or tension side of the slab. The strength of slabs reinforced in this way is almost incredible. A floor of this kind often does not exceed 3 ins. in thickness,

(3).—*Ribbed Flat-plate Construction.*—The best-known floors of this class in America are those constructed on the system known as "Ransomes." As an example may be mentioned a floor at the Pacific Coast Borax Co.'s works. Constable Hook, N.J. The floor slab, which is in one piece, is 4 ins. thick, and is supported by concrete-steel beams, which are reinforced by means of upper and lower bars, which vary in diameter from ½ in. to 1½ ins., together with stirrup bars at intervals. This floor was designed to support a load of 800 lbs. per sq. ft.

The modified De Vallière construction is similar to that just described, and is being regarded with much favour in America. The floors of the gymnasium of the University of Pennsylvania and of the Forrest Laundry at Philadelphia, Pa., are constructed on this principle.

A combination of hollow tiles and reinforced concrete joists instead of slabs has recently been introduced. The floors of the Marlborough Blenheim Hotel, already referred to, are constructed on this system, and as floors of this class are light, strong, and fireproof they are likely to be adopted very largely, especially as they are a little cheaper than the ordinary concrete-steel floor.

Roofs.

The author has used reinforced concrete to very great advantage in roof construction, and has found it to be an excellent material for this purpose. In America it has been used very largely in work of this kind, in flat, pitched and arched roofs.

Two systems of concrete-steel roof construction prevail in the United States—(1). Roofing slabs. (2). Monolithic construction.

(1). *Roofing Slabs.*—The reinforcement employed in the construction of the flat roof of the Government Printing Office at Washington was as follows:—Concrete-steel slabs, 12 ft. in width, were made reaching from eaves to ridge; these were 5 ins. in thickness, and moulded in place. The reinforcement consisted of a network of transverse and longitudinal twisted square bars. The joint at the ridge was filled with asphalt, and ¾-in. strips of pine were inserted in the joints between the slabs.

Reinforced roofing slabs are often made in another manner in America. The reinforcement consists of corrugated steel sheets. These are laid on the roof-framing and then plastered on both sides with cement mortar. The slabs are 1¼ ins. in thickness; they have the great advantage of being light and inexpensive, their weight being only 15 lbs. per sq. ft., and they cost about 21 dols. per 100 sq. ft.; the usual size is 20 ft. by 10 ft. by ½ in. in depth.

(2.) *Monolithic Construction.*—Most of the systems of concrete-steel floor construction are also suitable for roof construction. Monolithic construction is greatly used in America, and in flat and pitched roofs the reinforcement usually consists of ribbed plates. As an example of roof construction the author describes a combined mansard and flat roof of a New York residence (Fig. 10). The Hennebique system of reinforcement is here

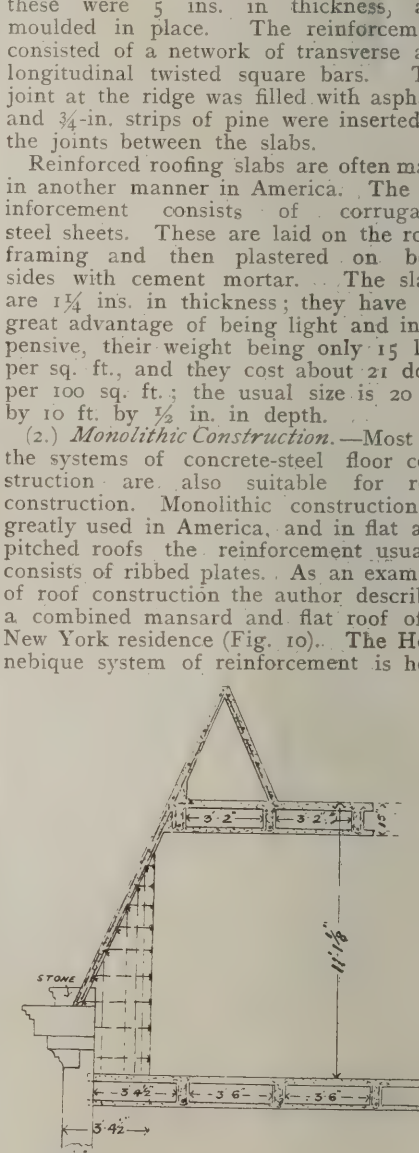


FIG. 10. COMBINED MANSARD AND FLAT ROOF IN REINFORCED CONCRETE, NEW YORK.

used. The roof covering consists of asphalt bricks welded together.

Domes and arched roofs are constructed in many ways, each system of reinforced concrete being considered by the patentee to be the best, but a very well-tried system is that in which the reinforcement consists of ¼ in. radial and circular twisted rods, as in the domed roof of the Court-house at Mineola, N.Y.

Girders and Columns.

Reinforced concrete has been found to be well adapted for a use of this kind, and especially for long-span girders. Many interesting examples of its use for this purpose might be named. The author, however, refers to one only—at the new College of Music at Cincinnati, Ohio. In connection with the construction of this building it was found necessary to put in a girder of 60 ft. 7 ins. span to carry the balcony. This girder was formed of reinforced-concrete. It was 12 ins. wide and 32 ins. deep, and was reinforced by means of eight 1⅜ in. rods, and ¾ in. strap-iron stirrups. The concrete for the girder was 1 : 2 : 3 and 1 : 2 : 4.

(1). *Column Foundations.*—The reinforced concrete foundations for columns in America resemble very much those for walls. The reinforcement consists of vertical rods which bear against one or more metal plates. Expanded metal sometimes takes the place of the rods and plates referred to.

(2). *Columns.*—These, in the United States, have been usually built with longitudinal rods, with or without lateral ties. The latest practice, however, is to insert a circumferential reinforcement, and to place inside of this the longitudinal rods. It is the practice to mould the columns in place in vertical forms; this is sometimes done in sections, and at other times the whole column is built in one operation. The first method is preferable, as the concrete can be better rammed in. In the second method, long-handled rammers are often employed, while it frequently occurs that no ramming takes place at all, but a liquid concrete is used, and this is expected to fill the form in every part, and thoroughly surround the reinforcement.

Stairs.

There are two general methods in America of constructing stairs with reinforced concrete. One is to construct the stairs of monolithic slabs of concrete, the under side of same being reinforced, the upper side being notched to form the treads and risers. In the other system the treads and risers are reinforced as well as the under side of slab.

Chimney Construction.

Most of the tall chimneys of factories, works, power stations, etc., in America are of steel-plate construction. This form of construction has undoubtedly many advantages over brick shafts as usually employed, the following being some of its advantages:—(1) Costs only about one-half that of a brick shaft, (2) more stable (3) absolutely proof against lightning, (4) occupies less space than brick shafts. Its disadvantages are that it is somewhat unsightly, and requires painting every three or four years. It has now, however, a new rival, namely, reinforced concrete. Many tall shafts formed of this material have been erected, and have so far proved satisfactory. This form of chimney can be erected cheaper than brick but not so cheap as steel-plate construction. It possesses one great advantage, however, over both of the others, namely, that once erected it needs no repairs, and improves instead of deteriorating with age. As an example of this form of construction we may take the reinforced concrete chimney of the Central Lard Co., Jersey City, N.J. (shown in Fig. 11). This chimney was designed and erected in 1901 by the Ransome Concrete Co. of New York City. Its outside diameter is 11 ft. 4 ins., the diameter of flue being 8ft.: the chimney is 108ft. in height. It has two shells, the inner one being 4 ins. thick, the outer varying in thickness from 7 ins. at the bottom of the shaft to 4 ins. at the top. Vertical ribs or buttresses connect the inner and outer shells. The shells are formed by reinforced concrete, and the reinforcement consists of circumferential rings and vertical bars of twisted square steel. Twisted rods form the reinforcement of the foundations. Taking the weight of a cub. ft. of concrete at 144 lbs., the total weight of the shaft is 362 tons. The chimney cost 3,500 dols. (£700).

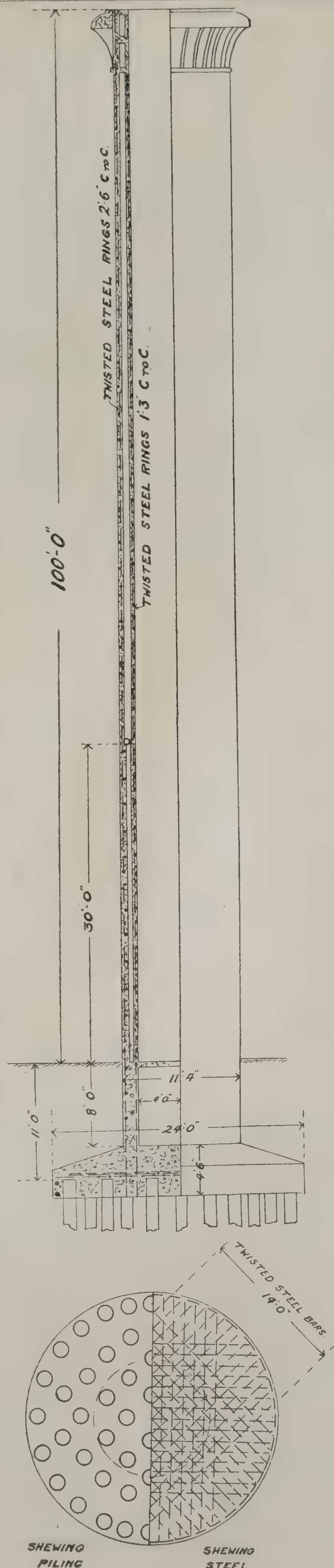


FIG. 11. REINFORCED CONCRETE CHIMNEY, JERSEY CITY, N.J.

Views and Reviews.

The Design of Bins and Stores.

This book will be found most interesting to architects and engineers who have specialised in the design of stores for grain, cement, and other material of a granular nature. The first part is devoted to the design of retaining walls, after which the design of bins for coal, ore, etc., is taken up in detail, being followed by the design of grain bins and elevators. Reinforced concrete is now extensively used for such structures as this book deals with, and therefore the author has wisely included a discussion of the theory of reinforced concrete, and has considered the formulæ necessary for use in design.

"The Retaining of Granular Materials; the design of Walls, Bins, and Grain-Elevators." By Milo S. Ketchum, Dean of the College of Engineering and Professor of Columbia University, Colorado. London: Archibald Constable and Co., 16, Orange Street, Leicester Square, W.C.; price 16s. net.

Concrete Bridges.

Concrete plain and reinforced is used extensively for the building of bridges, and the subject has not been sufficiently attended to as a rule in text-books. This pamphlet, providing general specifications for concrete bridges, will be found valuable by consulting and specialist engineers. It classifies the types of bridges, sets out the loads for which they should be designed, the assumptions for computing and designing bridges, unit stresses that should be allowed, quality of the materials and their proportion in mixing and placing, inspection and tests, and the manner in which the different types are to be computed, with final directions upon such matters as water-proofing, pavements, etc. An appendix provides the standard American specifications for cement, and a second appendix an analysis of reinforced concrete beams. A third appendix gives brief pavement specifications, and others the standard loading and other data for designing.

"General Specifications for Concrete Bridges." By Wilbur J. Watson, Cleveland, Ohio, U.S.A. M.A. Venson, 205-6, Caxton Building.

Large Boats of Reinforced Concrete have been built in Italy, and five of these, of 120 tons and more, were on commission for the Italian Navy. The first of these boats, a 120-ton barge, was built in 1906, on the plans of Mr. Gabellini, an Italian who has given his whole attention to reinforced concrete, and who for many years has been conducting experiments with this class of material. This boat, which was built with double bottom and of the cellular type, was submitted to severe tests in the Spezia Arsenal, where a much larger boat built of iron and with an iron ram was directed against it without producing any considerable damage to it. By reason of the satisfactory results given by this first boat, four more were ordered on account of the Italian navy.

FIG. 1.—SECOND TOBACCO WAREHOUSE, CUMBERLAND BASIN, BRISTOL, CONSTRUCTED ON THE COIGNET SYSTEM OF REINFORCED CONCRETE.

A BRISTOL TOBACCO WAREHOUSE.

The Second Tobacco Warehouse erected at Cumberland Basin, Bristol, which we illustrate in this issue, is a very large job; indeed, it is one of the largest reinforced concrete structures that has been built in this country, for not only is the area considerable, but the height is about 90 ft., there being nine floors.

The work has been executed on the Coignet system of reinforced concrete for the Bristol Corporation, under the supervision of the docks engineer, Mr. W. W. Squire, M.I.C.E. The contractors for the work were Messrs. W. Cowlin and Son, of Bristol, licensees of the Coignet system.

The First Tobacco Warehouse, which was also executed by the same contractors, was built in brickwork with heavy steel stanchions and girders and ordinary concrete flooring, and the foundations consisted of heavy concrete masonry. The Second Tobacco Warehouse is built entirely of reinforced concrete, and is supported on reinforced piles. The adoption of reinforced concrete was due to the great economy and rapidity of construction, in comparison with the ordinary type adopted for the first warehouse, and also as regards the fire-resisting qualities of the construction. The dimensions of the building are, roughly: Length, 215 ft., width, 102 ft., and height, 96 ft. The nine floors are supported by 103 pillars on each floor. These pillars or posts diminish from 2 ft. 8 ins. with eight $1\frac{5}{8}$ in. diameter reinforcing rods in the basement to 8 ins., with four $\frac{1}{2}$ in. diameter reinforcing rods on the ninth floor. The building is of frame construction, and the external posts carry lintels which support brick panelling 14 ins. in thickness. By the adoption of frame construction, a great saving was effected in these brick panels over the older type of heavy brick walls; the weight on the foundations was rendered much less thereby, and the interior accommodation was increased. The whole of the stairs and landings are also in reinforced concrete. The roof, however, is of steelwork on account of the large area of glazing required. The floors were calculated for a super-imposed load of $1\frac{1}{2}$ cwts. per sq. ft.

The building is divided, as shown, by the longitudinal section, into two portions by a reinforced concrete partition wall 6 ins. in thickness, and the floors are so arranged that it is possible to flood any particular floor with a few inches of water in case of fire. All the doors are fireproof, and the walls of the lifts are made of reinforced concrete in the same manner as the partition wall above referred to.

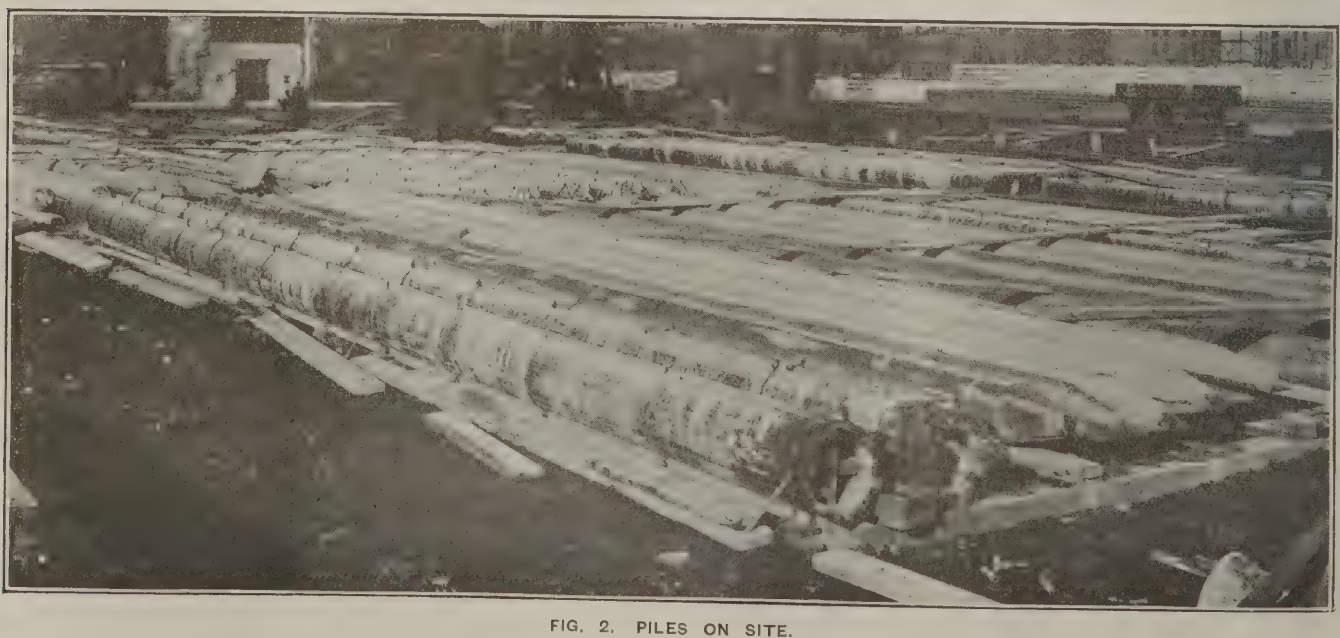


FIG. 2. PILES ON SITE.

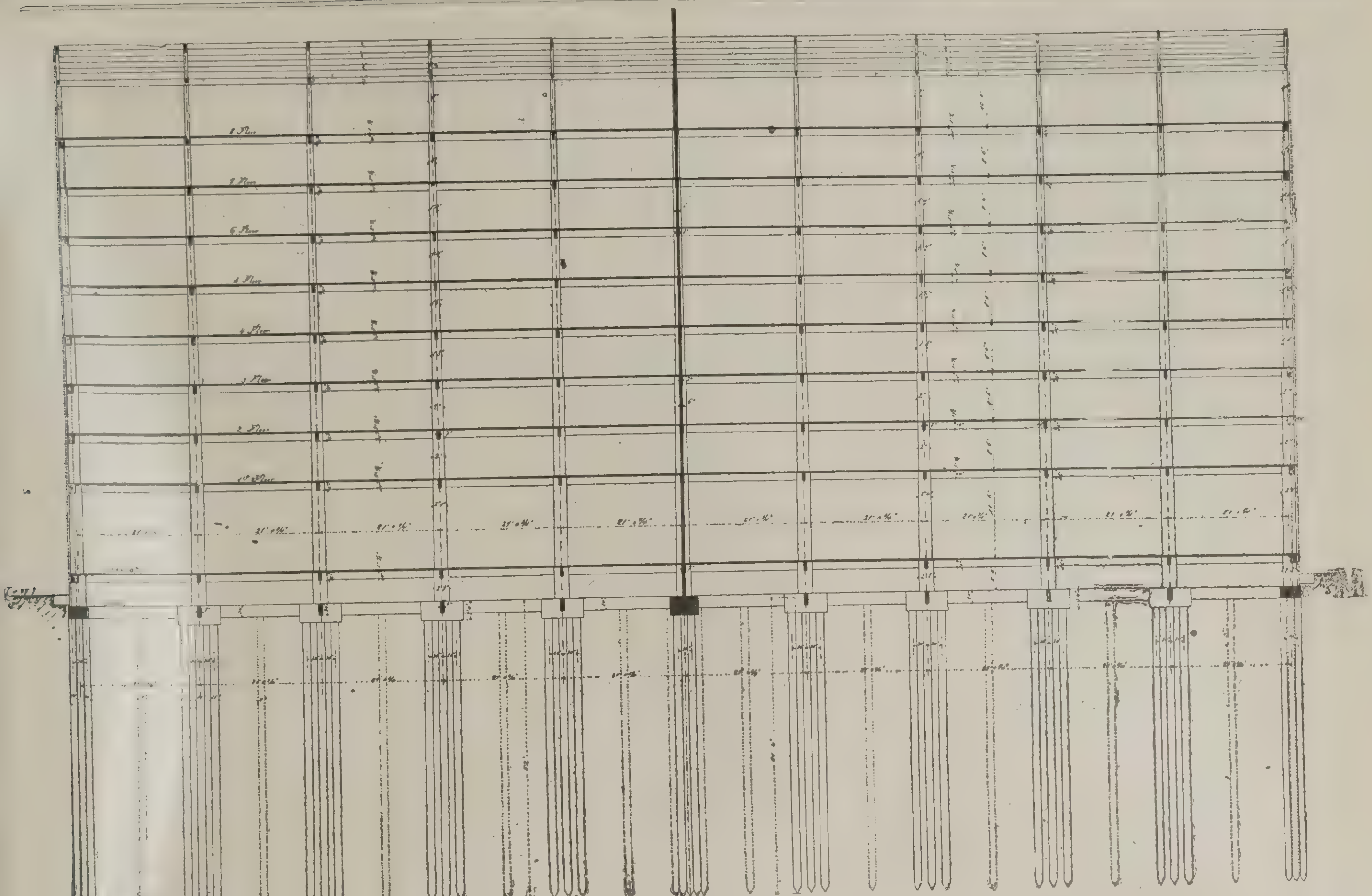
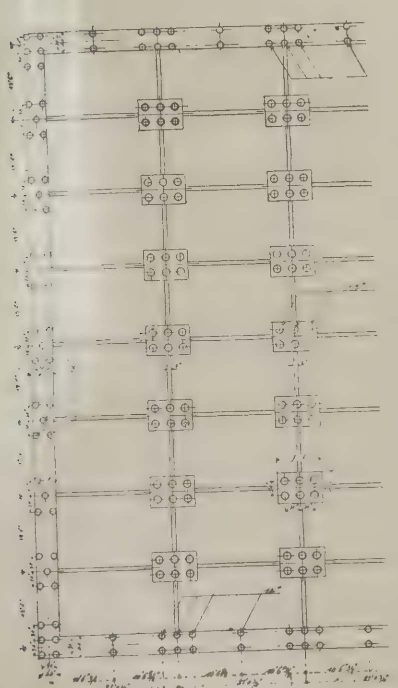


FIG. 3.—SECOND TOBACCO WAREHOUSE, BRISTOL.
Longitudinal section, showing arrangement of Piles.



PORTION OF PLAN SHOWING PILES.

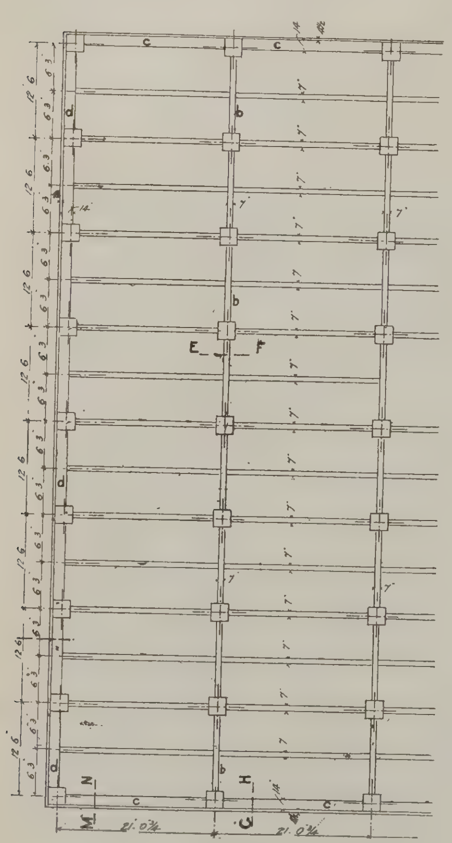
The total load upon each of the pillars in the basement amounts to about 300 tons, and the foundations consist of 650 piles, arranged as shown on the foundation plan. The piles were built on the Coignet system. They were constructed of considerable length in order to reach a stratum of gravel situated at a depth of about 45 ft. below the surface. The piles were moulded as shown in Fig. 2, the forms being visible in the foreground with completed piles from which the forms have been removed, shown behind, this view being taken on the site to show the piles hardening. It may be mentioned that the circular section adopted for the Coignet piles allows them to be driven easier than square piles. The reinforcement consists of longitudinal rods of large section with a spiral binding of similar rods. The area of the foundations is approximately 215 ft. by 102 ft. Each pile was calculated for a safe load of 56 tons, and some of the piles were tested to 90 tons without any sign of failure or sinking. The diameters of the piles vary between 14 ins. and 15 ins., and two flat surfaces about 5 ins. wide were provided for guiding purposes during the operation of driving. The concrete used for moulding these piles was mechanically mixed, and made of Portland cement, sand and

FIG. 4.—SECOND TOBACCO WAREHOUSE, BRISTOL: AN UPPER FLOOR.

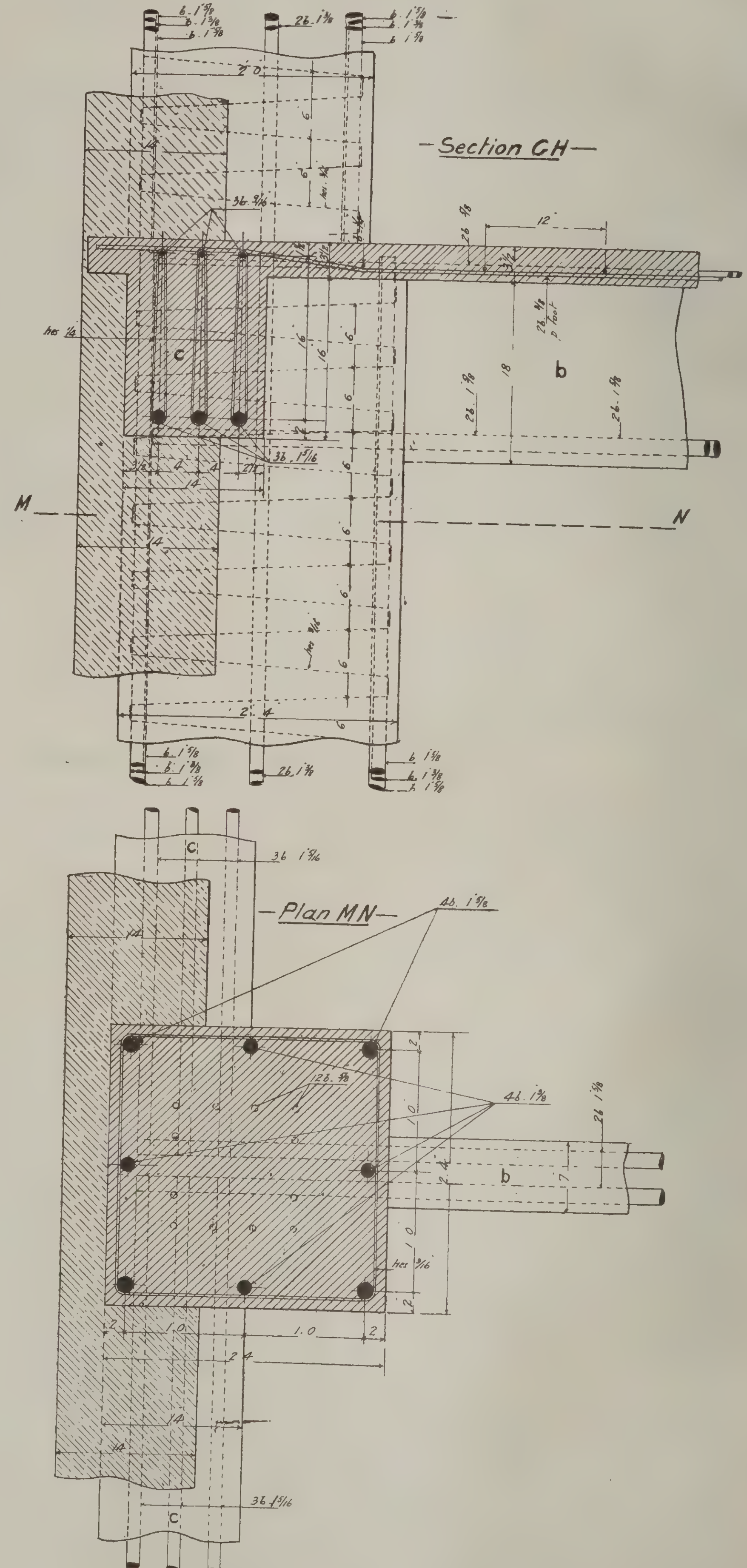
granite chippings. The piles were moulded horizontally, the forms consisting of two semi-circular detachable sides of wood, composed of lagging clamped together with iron supports spaced a short distance apart, the mild steel framework being made complete and suspended inside the mould or form from the upper bolts of the iron clamps retaining the lagging boards. As soon as the concrete had begun to set the sides were removed and the pile allowed to season for about a fortnight before being removed from the base-board. The weight of each pile was about five tons. In all, six weeks were allowed for seasoning before the driving took place. At the head of each pile a wooden dolly was fitted in order to prevent the steam donkey from injuring the concrete. The weight of the monkey was about two tons and the drop about 4 ft. Some piles received over two thousand blows without any injury; this showing their great strength. Two pile-drivers were used, and the work, when nearing completion, was carried on at night, and in this manner about twelve piles were driven about every twenty-four hours.

The piles were driven in groups of six, and a reinforced concrete cap was provided in order to evenly spread the load of the pillars supporting the floors, each consisting of about 300 tons, as above stated, in each case. The piles for the wall foundation were connected continuously by a broad reinforced concrete beam.

Fig. 5 shows a detail of the reinforcement of the beams and floor slabs, and Fig. 4 shows the interior of the completed structure. The beams were calculated as T shaped sustaining slabs. The whole job is an interesting example of reinforced concrete construction designed scientifically. Every advantage has been taken of this form of construction in the general scheme, and the resultant economy has been very considerable.

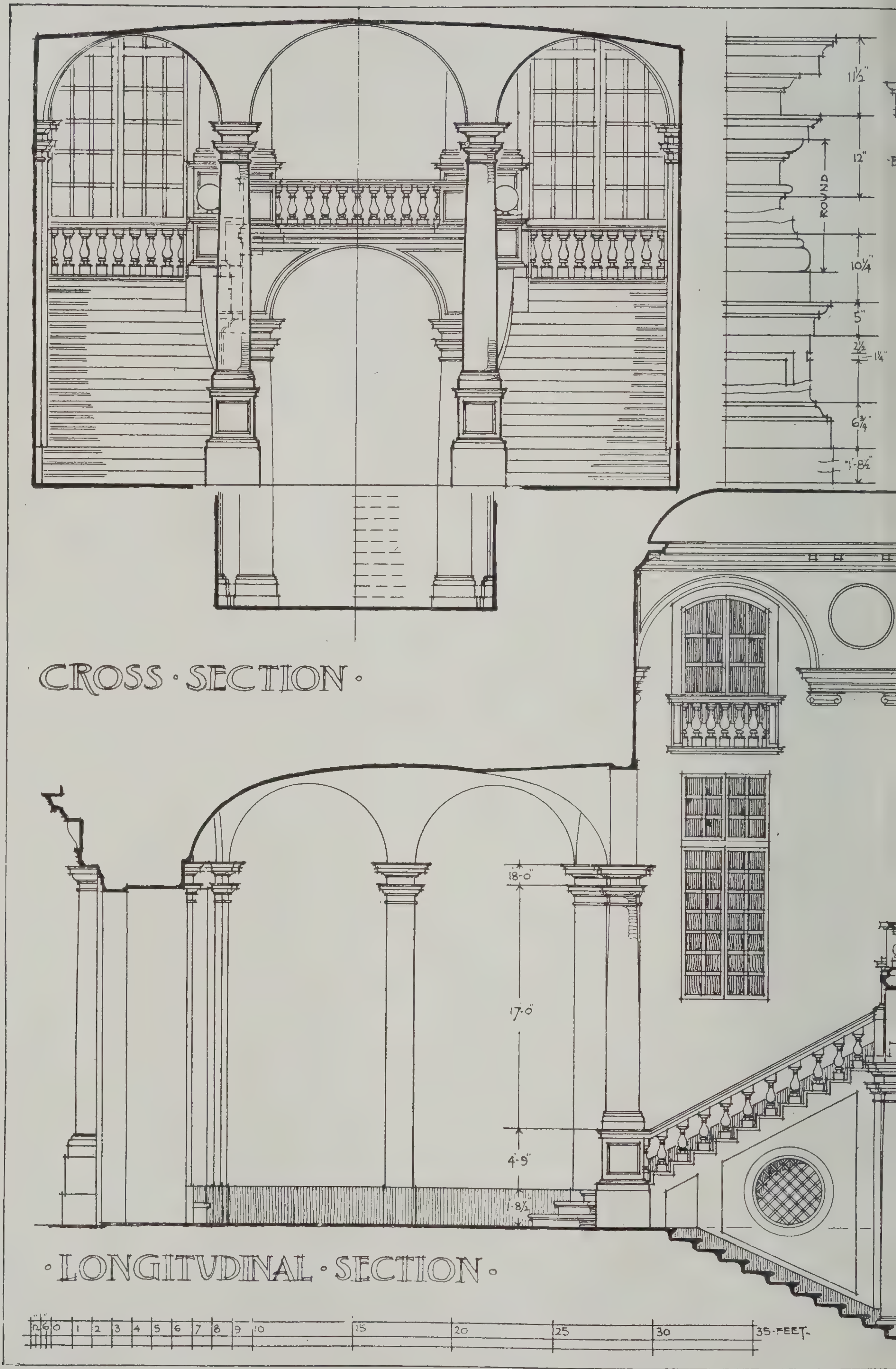


Portion of Plan.



Details of Connections, First Floor.

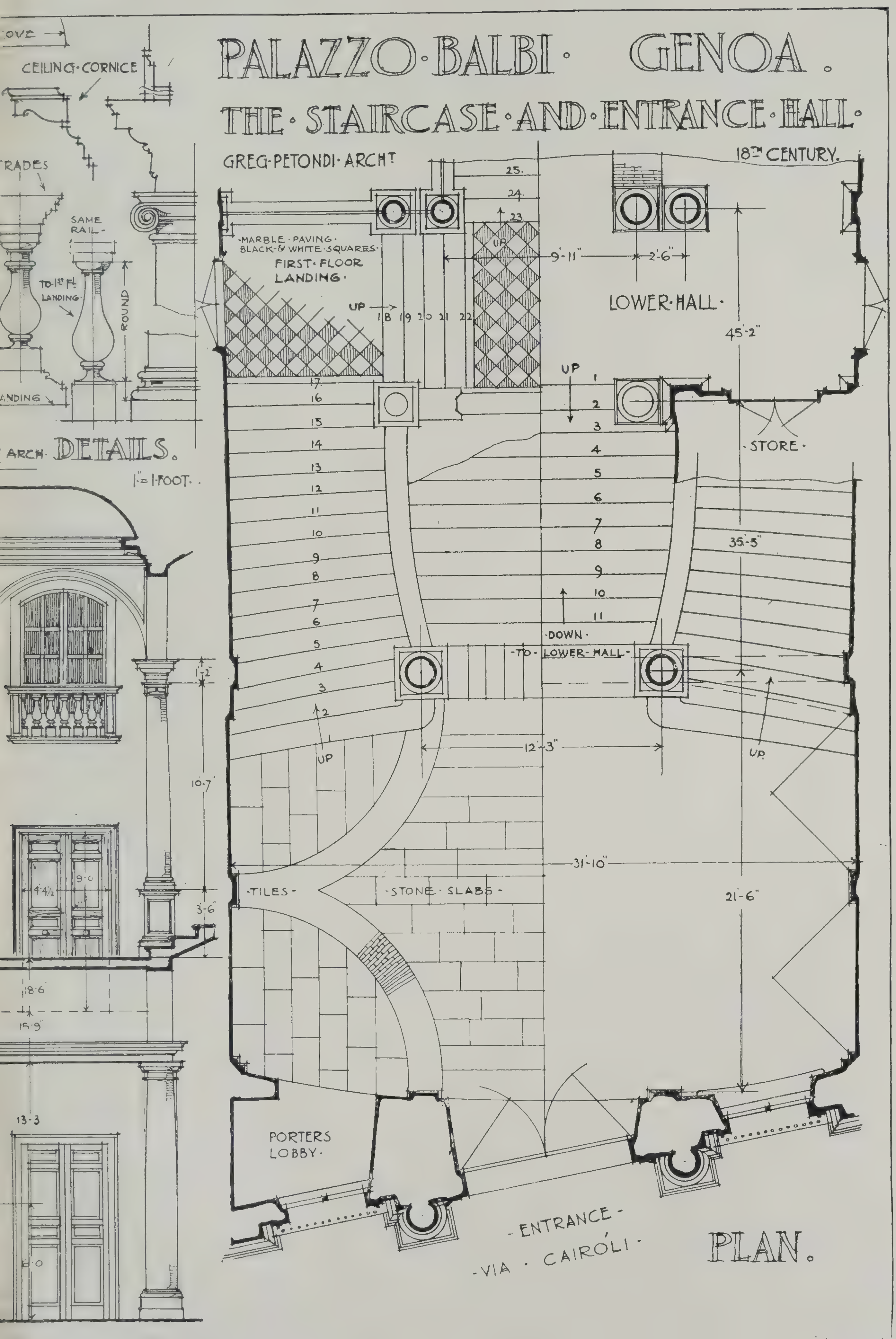
FIG 5.—SECOND TOBACCO WAREHOUSE, BRISTOL.



CROSS · SECTION ·

· LONGITUDINAL · SECTION ·

MEASURED AND DRAWN



LESLIE WILKINSON, A.R.I.B.A.

April 29, 1908. Volume 28 No. 690.

THE BUILDERS' JOURNAL
AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

The Apotheosis of the New Art. We have received an illustrated advertisement of the forthcoming Hessian National Exhibition which is to be opened at Darmstadt on May 23rd and is to remain open until the end of October. The outcome of the former exhibition held, in 1901, at Darmstadt—the first city in Germany to promote an exhibition solely devoted to the arts and crafts—appears to have been "the formation of a basis from which the newly-born and still-hesitating forms of applied art could take their course," and the institution, by the Grand Duke Ernest Ludwig, of an artists' settlement which (to quote again the descriptive advertisement) "has since endeavoured to show, with energy and success, that the twentieth century can surround itself with works suited to its special needs without slavishly imitating past generations." Whilst we are quite prepared to admit that the designs produced under the influence of the leaders of the New Art movement are absolutely free from the slightest trace of any attempt to imitate the artistic productions of bygone ages, yet, from the first, there appears to have been something radically wrong with this wonderful phase of art. For instance, on page 3 of the pamphlet under notice, we are reminded that "although such a short time has elapsed since Modern Art called attention to itself, it seems as if the somewhat bizarre and exaggerated expressions of its first appearance lay far behind it." Thus, within the short space of seven years Modern Art is admitted by her votaries to have passed through one stage of what we trust will ultimately prove to be a very ephemeral existence. But, for the moment, the admirers of the latest form of art need not despair, as the "exaggerations common to all strong causes have already given place to *moderation* and *clearness of aim*" (the italics are our own), and they are promised that a movement which has, thus far, distinguished itself by passing with unprecedented rapidity through an early stage of transition will present them with "many and various interesting developments in the future." We do not doubt that the pledge will be redeemed, but, to speak quite frankly, we look forward with absolute dread to the advent of the promised new species of the New Art. The avowed aim of the promoters of the forthcoming Exhibition is to depict the present state of art in Hessen, and, with this object, all "side-shows" have been—in our opinion most unwisely—excluded. Thus shorn of subsidiary attractions, the Exhibition will consist of pictures, sculpture, artistically-furnished rooms, houses, gardens and workmen's cottages—emanating chiefly from the newly-founded studios for applied art which are among the permanent features of the Exhibition. It is expected by the promoters—and (after an examination of a photograph of the building) by ourselves—that "much interest and discussion" will centre round the large permanent main exhibition building, while, as in 1901, the "Hocheitsturm" crowning, "like an acropolic," the "Mathilden-Hoehe will bear witness to a rich harvest of artistic work differing in many ways from the first exhibition, but representing, we regret to be obliged to add, "the flower and fruit of the seeds then planted." However, Darmstadt is worth a visit, on account of its old castle and Holbein's "Madonna."

"Le Lock-out." The dispute with the masons in Paris, it is amusing to note, is almost invariably referred to in the French newspapers as "le lock-out;" while the workmen, in at least one of their remarkably frequent manifestoes, introduce the beautiful word "bluff," which, in the instance noticed, is used as a substantive. Like "le lock-out," it is treated as a noun masculine. As probably trade unionism was imported into France from England, it is only natural that "le bluff" and "le lock-out" should follow in its wake. The origin of both words is sometimes claimed for America.

"Tube" Vibration in Paris. The surface disturbance caused by the construction of and the running of trains in the London "tube" railways is finding its counterpart in Paris, where a regular network of underground railways is being provided. The first portion of the "Underground Metropolitan Railway of Paris" has been open nearly ten years, but it is only recently that any serious complaint has been made about the vibration caused by the trains. The construction works have been held guilty for the subsidence of several houses, for the grave danger that threatened the Place de la Concorde and the Obelisk, and for having allowed one or two quarters of Paris to be flooded; and to-day these objectionable vibrations are called to account—together with the tunnelling operations for the construction of the "tube" between Montmartre and Montparnasse—for causing injury to one of the most beautiful buildings in Paris. The Department of the Marine, which is the building threatened, stands on the north side of the Place de la Concorde, and is one of the two palaces built by the great architect Gabriel for Louis XV., who desired to provide Ambassadors with suitable apartments. The other palace is occupied by the Automobile Club de France. The Department of Fine Art has enquired into the matter, and though, so far, the building is by no means seriously affected, there is some anxiety as to how the progress of the evil shall be prevented.

London's Town-planning Problem. Although town-planning and the traffic problem must sooner or later be dealt with comprehensively—as it undoubtedly will be if Mr. John Burns gets his way—it is nevertheless certain that piecemeal discussion of the subject by those whose professional standing entitles them to be heard has obvious uses. Several well-known architects have, at various times, confided their pet schemes to the public. Mr. Paul Waterhouse, it will be remembered, has made much of the opportunity presented by the proposed re-building of Southwark Bridge. He suggests, in connection with that undertaking, the formation of a new thoroughfare on the south side of the Thames, stretching from Southwark Bridge to Westminster Bridge. As to this proposal, a newspaper interviewer has sought the opinion of Mr. J. Douglass Mathews, F.R.I.B.A., whose views happen to be adverse to those of Mr. Waterhouse, and, since vigorous opposition is always more valuable than indolent assent, they are therefore all the more serviceable as a contribution towards solving the problem. Mr. Matthews, who has been a close student of the traffic problem ever since the early 'seventies, and who was one of the witnesses examined by the Traffic Commission, admits that Mr. Waterhouse's scheme would make a magnificent improvement on the south side of the Thames, but he thinks that its effect on the traffic problem would be to render confusion worse confounded. The streets in the Cheapside and Mansion House district would then, he thinks, become more hopelessly congested than ever. The enthusiast for noble thoroughfares always meets objections to expense by imagining highly-enhanced values for

improved frontages; but on this point Mr. Mathews is coldly sceptical. He strongly doubts whether the consequent appreciation of property south of the river would be of more than infinitesimal account as a set-off against the huge cost of forming the thoroughfare. He points out, also, that even if, in re-building Southwark Bridge, the gradient on the south side can be easily reduced, there remains the very formidable difficulty of arranging an easy approach on the north side. In reply to Mr. Waterhouse's remark that "Upper Thames Street could easily be depressed, when Queen Street would pass very pleasantly over the head of Upper Thames Street," Mr. Mathews recalls the awkward fact that a Bill promoted by the Bridge House Estates Committee a few years ago was wrecked on the proposal to raise Upper Thames Street some three or four feet in order to help the approach from Queen Street. The Traffic Commission favoured the construction of two main routes across London—one east and west, and the other north and south; but Mr. Waterhouse's scheme does not appear to conduce to either; and, in Mr. Mathews' opinion, unless a new Southwark Bridge could help to accomplish a direct route from north to south, it would be useless for the Corporation to expend its money on re-building it. Mr. Mathews would prefer to connect the extreme north with the extreme south of London by forming a viaduct, from the new bridge, over Upper Thames Street, in a slightly westerly direction as far as Queen Victoria Street, opposite the end of Bread Street. This thoroughfare would continue through Red Cross Street, Golden Lane, Central Street, and Graham Street, to Islington, thus giving a direct route from the Elephant and Castle to Upper Street, and thence to the Great North Road. These rival schemes are doubtless interesting and instructive; but of course a really practical issue depends on the fate of Mr. Burns's Bill.

PALAZZO BALBI SENAREGA, GENOA: HALL. BARTOLOMMEO BIANCO, ARCHITECT.

Chesterton and the Gargoyle of Bruges.

Mr. G. K. Chesterton, being on his travels, has discovered the Belfry of Bruges. He has mercifully refrained from turning it upside down. One gathers, indeed, that he rather approves of it, apparently because "it is built in defiance of all decencies of architecture." He describes it, presumably without prejudice, as a "church on stilts." But "this sort of sublime deformity," he declares, is characteristic of the whole fancy and energy of these Flemish cities. Flanders has the flattest and most prosaic of landscapes, but the most violent and extravagant of buildings." Gothic buildings, he observes, are full of extravagant details; but the Belfry of Bruges is extravagant in design. Again, "All Christian temples worth talking about have gargoyles; but Bruges Belfry *is* a gargoyle." The men of Bruges, it appears, "sacrificed architecture and everything to the sense of dizzy and divine heights, . . . because Nature gave them no encouragement to do so." This gargoyle on stilts, this sublime deformity, Mr. Chesterton further defines as "an unnaturally long-necked animal, like a giraffe." Being more than common tall, the "Belfry, old and brown, thrice consumed and thrice rebuilded," is perhaps fittingly celebrated in verse by the auspiciously named Longfellow, who, one may suppose, according to Mr. Chesterton's rule of contraries, might have been inspired to loftier verse by a lowlier tower. Mr. Chesterton's further incursions in this domain (though he has not promised any) are awaited with lively interest. His judgments, if unorthodox, are at least exhilarating; but it must always be remembered that, in the words of a popular handbook, Mr. Chesterton "carves gargoyles from everything he meets in literature and life."

The Fight for the Relics of Crosby Hall.

We have already drawn attention to two proposals for the re-erection of Crosby Hall—one being its utilisation as part of the More House Settlement at Chelsea, and another, which has been more recently made public, for rebuilding it in the gardens of Leighton House, Kensington. It now appears, from a report of the meeting of the Bishopsgate Vestry held on April 23rd, that the Rector has been approached on the question of the possibility (and the desirability) of re-erecting Crosby Hall in the precincts of the Church of St. Botolph, and after some discussion a sub-committee was appointed to consider the question. So far as we are aware, no very large amount of enthusiasm was evinced by the public in coming forward with subscriptions (when they were urgently needed) to save the building from destruction, but immediately it was demolished, and much of its real interest and value thereby lost for ever, a keen fight commenced (which is still raging fast and furious) for the possession of the remains of what was once Crosby Hall. Truly we are a wonderful nation!

Mont Saint Michel.

The "Times" of April 21st contains a communication of a rather alarming nature, to the effect that this picturesque relic of a once flourishing monastery is threatened with destruction. "Three things are completely altering Mont Saint Michel: the dike, the efforts to reclaim land from the sea (*colmatage*), and the modernisation of the building itself." The curious rocky islet known as Mont Saint Michel consists of a mass of granite about 3,000 ft. in compass and 165 ft. in height which rises at a distance of nearly a mile from the shore in Saint Michel's bay at the vertex of the angle formed by the sea coasts of Normandy and Brittany. At low water the quicksands, stretching far to seaward, by which it is surrounded, are altogether exposed. The efforts at reclamation made in our own time, including the construction of a causeway connecting Mont Saint Michel with the nearest point of

the mainland (near Moidrey), and the formation of a dike to protect the works of the company which was formed with the view of transforming the sand into pasture land, have had the unfortunate result of so altering the tidal currents of the sea that portions of the ramparts have become cracked and the walls undermined. This being so, it is satisfactory to know that active measures are being taken by the French Government for the preservation of this wonderful historical monument.

The Shakespeare Memorial. The newspaper controversy as to the form to be taken by the proposed Shakespeare memorial seems to be rather superfluous. The matter is settled—authoritatively, if not finally—in a letter dated "Shakespeare Day," which is, of course, St. George's Day, April 23rd, and appearing in the "Times" of Friday last, which states that at a meeting of the general committee nominated at the numerous and influential public meeting held at the Mansion House in 1905, a special committee was appointed to consider the question, and, after careful consideration, the recommendation made by this committee was that "the form of the memorial be that of an architectural monument, including a statue." This recommendation was submitted to the general committee, by whom it was unanimously adopted, and an executive committee was then formed to act upon it. Moreover, a competition for the design is now being arranged for the erection of a monument by 1916, the tercentenary of Shakespeare's death. The letter in which this very definite announcement is made bears the following signatures: "Plymouth, John C. Bell (Lord Mayor), Avebury (treasurer), Reay, A. C. Lyall, E. J. Poynter, E. Maunde Thompson, W. B. Richmond, Edward Braybrook, Aston Webb, John Belcher, F. R. Benson, Thomas Brock, S. H. Butcher, Hugh Chisholm, Sidney Colvin, Walter Crane, F. J. Furnivall, Sidney Lee, J. Forbes Robertson, Bram Stoker, H. Beerbohm Tree, A. W. Ward, I. Gollancz (hon. secretary)." Architects are not likely to find fault either with the composition of this committee or with the decision at which it has arrived; but it yet remains to be seen whether the public who supply the money will agree to the proposed method of spending it.

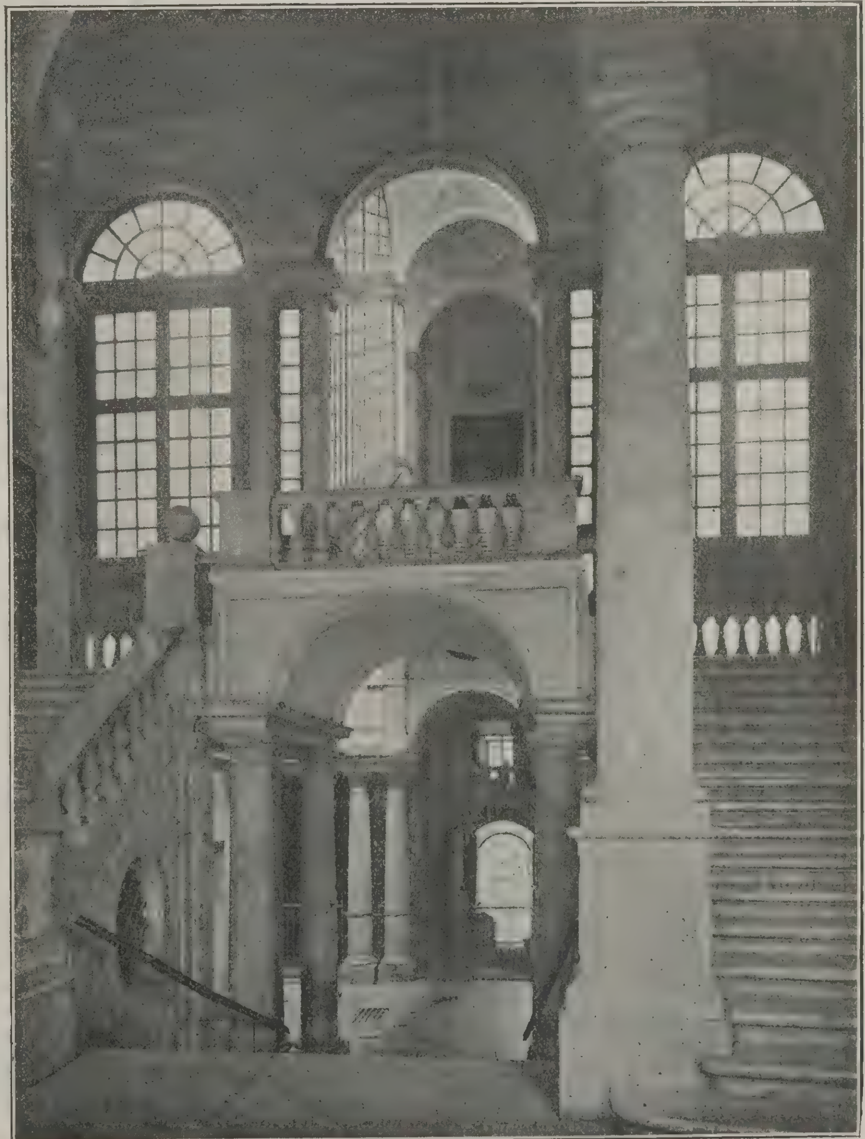
The Grouting Machine. If we may judge from the numerous letters and other communications which have recently appeared in the public press, considerable interest seems to be manifested in the possibilities of the further development of a machine which has already proved its usefulness and reliability in making good the defects in the foundations and walls of ancient structures. We are not aware, however, that any of the communications which have appeared in the newspapers since Mr. Francis Fox read his exhaustive paper on the grouting machine before the members of the Royal Institute of British Architects have added to our stock of knowledge on the subject, but it may perhaps be of interest to state that the method of reparation now performed by the grouting machine was applied to certain buildings more than forty years ago through the agency of a funnel to which was attached a vertical pipe of the length necessary to give the required hydrostatic pressure. As our readers know, the work is now far more rapidly effected by the cleverly devised and scientifically constructed machine which has been so recently described in this journal.

The Archbishop's Climb. The Archbishop of Canterbury, not satisfied with being at the top of his profession, has daringly ascended to the summit of his cathedral. The repair of the "Bell Harry" tower—a magnificent example of the Perpendicular style, dating from 1498, and admittedly the most majestic tower in England—was formally finished by His Grace fixing a coping-stone of the western pinnacle. The height to the top of the pinnacle being 235 ft., the Archbishop, on reaching such a dizzy eminence, may perhaps have recalled with some degree of sympathy the levity on a similar occasion, of a certain Colonial bishop who cheerfully admitted that never before had he felt so much like a High Churchman. But, in performing this somewhat hazardous feat, has not the good Archbishop encouraged a rather bad precedent? The worries and responsibilities of architects and builders must be enormously increased by the onus of safely conveying elderly and portly Church dignitaries so far in what is popularly assumed to be the direction of heaven.

THE PALAZZO BALBI, GENOA.

The entrance hall and staircase of this palace (which we illustrate in this issue) is one of the most pleasing in Genoa—that city of grand palaces. Although not large, the effect is most stately, and the detail simple and refined. The setting-out of the plan (see centre plate) is interesting, and the predominance of curved lines should be noticed. The central flight leads down through a cortile to the lower-lying Via Lomellini, while the side flights, ascending to the mezzanine landing, meet over the central arch, whence a single flight continues up to the *piano nobile*. The palace was erected in the eighteenth century by Greg. Petondi. It should not be confused with the Palazzo Balbi Senarega—one of the Genoese palaces designed by Bianco; of this latter we give, on the opposite page, a view of the entrance hall—a most picturesque piece of work.

Another monument to Cardinal Manning, in addition to that which is being prepared for erection over the Cardinal's tomb in Westminster Cathedral, is proposed for some site within the arch-diocese. It is to commemorate his work among the children of the poorer classes.



PALAZZO BALBI, GENOA: UPPER PART OF STAIRCASE. GREG. PETONDI, ARCHITECT.

SOME POINTS IN ARCHITECTURAL PRACTICE.

In his recent presidential address to the Bristol Society of Architects, Mr. H. Dare Bryan, F.R.I.B.A., referred to many matters of general interest.

Turning first to the question of

The Institute and Registration,

he expressed regret that it had not been possible to prepare a practical scheme of registration, which was the generally accepted term for the endeavour to close the ranks of the profession once and for all against the continuous entry of unqualified, untrained, and often untrustworthy rivals. As a Society, they had declared in favour of registration, and he saw no reason for going back on this decision; some measure of this kind was the simplest, quickest and most efficient way of dealing with the many disadvantages under which reputable architects at present laboured. It was inexplicable to him why the opponents of registration included such a majority of the ablest men in the profession, men whom they respected on account of their artistic attainments, personal character, and genuine enthusiasm for their art; such, however, was the regrettable fact, and to this he attributed the present failure of the movement, although he anticipated that in less than a generation we should see this long-desired measure an accomplished fact. During the stress of the movement registrationists were twitted with the desire to create a trade-union, but at the Institute Council the principle of dignified combination on the part of architects against unfair conditions was warmly defended both by Mr. Collcutt, the president, and by Mr. Hare, the senior vice-president, and one need not despair therefore of the goal being ultimately attained.

Continuing, Mr. Dare Bryan made reference to the revised charter of the Institute, and the provision made therein for the new class of Licentiates, and he then went on to speak of the general dearth of architectural work throughout the Kingdom, and the local influences at work at Bristol.

Modern Materials.

The president next drew attention to the increasingly complex work of the architect of to-day, compared with that of his predecessors of two generations ago. He instanced the increase in such matters as steel construction and reinforced concrete, sound-proof partitions, methods of flooring and paving too numerous to mention, sanitary appliances, hot-water supply and heating, and the many complicated systems of combined heating and ventilation, lifts (hydraulic and electric), gas generation, sewage treatment and disposal, to say nothing of the thousand and one patent materials of all descriptions which had appeared in recent years, with all of which the architect was expected to be familiar.

"Some of these inventions are of doubtful utility and in many instances are used in an unthinking manner, just because it is the method of the moment, but new methods are not necessarily improvements, and oftentimes the old way is the better one. Reinforced concrete, however, is a method of construction which I think has proved its claim to our serious consideration, and it is hoped that its development will not be left to patentees and civil engineers, but that it will be developed on right lines by men possessed of the true architectonic spirit, who will use the material in a logical and artistic manner. Reinforced concrete possesses great possibilities, and puts into our hands the power to rival Byzantine methods of building. Great domed areas with plain wall spaces overlaid with applied decoration seem to be its natural treatment, and buildings such as Bentley's cathedral at Westminster could be constructed without difficulty and at very moderate expense. The question of

Expense in Building

is one to which we should also devote our attention during these times of commercial depression. A saving is possible in many directions, and some method should be possible of grading the quality of building and building materials; our specifications uniformly require that everything should be the best of its kind, as well for the little shop in a back street as for a church or the palace of a millionaire. In buildings of one or two storeys where no weight has to be carried, thin hollow walls might more often be employed, and the walls of domestic buildings do not require to be so solidly built and bonded as do walls of the weight-bearing character required in factories and business premises. Regularity in size and colour of bricks and tiles, if insisted upon, increases the cost, oftentimes at the expense of the artistic result; and breadth of effect and economy are both served by the employment of few materials and the absence of those so-called dressings which more often than not spoil our buildings. Then, again, elaborately moulded cornices, architraves and other enrichments necessarily add to the expense, and entail much labour in keeping them in a clean and hygienic condition. It has been said that life would be more tolerable if it were not for its pleasures, and many of our buildings would be more tolerable if it were not for their ornament.

"Another difficulty we have to contend with is

the Lack of Intelligent Workmen.

The elementary Education Acts of this country have undoubtedly wrought evil as well as good; it is a little more than a generation since compulsory education was adopted, with the result that large numbers of young men, having a somewhat greater knowledge of the three R's than their parents, have been brought up as clerks instead of, as was formerly the case, being apprenticed to a trade or handicraft. Builders find great difficulty in obtaining a suitable class of apprentices, with the consequence that good intelligent workmen, with a thorough knowledge of their trade, are every day becoming scarcer. The journeyman of to-day—there are of course exceptions—is less thorough than his predecessor, and does not take the interest in his work that the old-time tradesman did, and no better work could be done by wealthy and philanthropic individuals and societies than to encourage, by means of apprenticeship, the raising of a large body of competent and intelligent artificers, upon whom both the physical and mental well-being of the community so largely depend."

The Loud in Design.

Speaking on the ever-green subject of competitions, without which no address on architecture could possibly be deemed complete, Mr. Dare Bryan made passing reference to the competition for the London County Hall, and then went on to deal with general principles. He said:

"There still continue in many instances reasonable grounds for dissatisfaction, and there have been several such cases during the past year; in a recent glaring instance one of our ablest architects having shown a lack of loyalty to his colleagues which is much to be regretted and reprobated. On the whole, however, it must be admitted that architectural competitions are for the benefit of both the public and the profession; and that they have tended to raise the standard of architecture, few I think will deny. The danger, however, is very real that designs of loud and telling character are too often accepted, and work showing greater refinement and restraint is liable to be passed over; this should be guarded against by greater care in the selection of assessors. We cannot expect perfection in the individual, and just now in certain directions there is agitation in favour of the jury system: the result of the Palace of Peace competition, however, does not incline one to support this agitation, and a preferable method seems to be in important competitions the appointment of one responsible assessor with, say, two assistant assessors; this is Mr. Collcutt's idea, and it is, I think, a very sound one.

"The perfect assessor should give every good and bad point in each design its due weight, and then the whole thing would be worked out by mathematical equation, which ought to satisfy everybody; the personal equation, however, often overrides the mathematical one, I fear: hence these tears and complainings which do not conduce to the dignity of our profession. Should there be no reason to doubt the good faith of the assessor, and if the instructions and conditions have not been grossly ignored, then I think we hould accept the result as sportsmen and try again.

The Return.

"It is a gratifying sign in the work of to-day to notice a return to the study of those great historic styles founded upon ancient classic architecture. On every side there are signs of scholarship, and the careful study of those proportions which for 2,000 years have been universally admired by the trained eye. It is conceit on our part to think that we can to-day evolve a new scale of proportions, or that the Ionic capital can be improved by turning it upside down. If we are wise we shall conserve our energy by accepting those main features and proportions which are the result of generations of great artists, and devote our efforts to the solution of those special problems which must necessarily arise in the work of to-day. A thorough grounding in those great principles to be found in classic architecture is the thing most needed at the present day, and this can be obtained by study of the work of Palladio, Sansovino, Sanmicheli, Peruzzi, Scamozzi, and other great masters of our art. Much may be learnt from their books, and I should like to remind you that our greatest English architect, Wren, acquired nearly all his knowledge by the study of books; has it ever occurred to you that in Wren's time, with the exception of the Banqueting House at Whitehall, one or two houses of Inigo Jones, and a few bits of Italian Renaissance detail of Henry VIII.'s time, there was no classic work in England, and very little in France? Wren was never in Italy, although he visited France, and it is I think conclusive evidence of the value of scholarship and the intelligent study of books that Sir Christopher was able to

produce those delightfully proportioned and carefully detailed works which will always command our admiration.

"Do not think that I advocate the dry-as-dust revivals of the latter part of our 18th century: far from it; I instance Wren to the contrary: his learning, passing through the crucible of his artistic genius, produced work that was entirely individual and characteristic, marked by a sanity and restraint which we feel to be essentially English, and although we cannot hope to emulate him, we can follow upon similar lines and endeavour, upon a foundation of scholarly knowledge, to produce works which will be sane and artistic solutions of modern-day requirements.

"We have all erred and strayed like lost sheep, but now there seems evidence of a return to the well-marked road of tradition, and to the study of those works of the past which evidence restraint, dignity, proportion and fitness. The merely picturesque has held us in thrall too long."

"SOME JACKS THAT BUILT HOUSES" is the title of an article in the current issue of "Chambers' Journal," embodying some agreeable gossip about the famous family of the Mylnes, who were master-masons to the Kings of Scotland from James III. all down the Stuart dynasty to Queen Anne. "The first master-mason, John Mylne, was appointed in 1482; in 1890 there died a Robert Mylne, architect and engineer. Twelve generations in direct descent—four centuries—all architects. A wonderful record!" Many of these Mylnes were called John. Hence the subtle literary allusion in the title.

Views and Reviews.

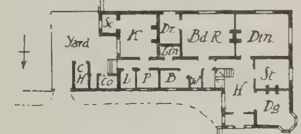
London By-laws.

"London Laws and By-laws," collected, edited and indexed by Mr. Charles William Tagg, Town Clerk of Camberwell, and Mr. Louis Oliver Glenister, Solicitor of the Supreme Court, form a quite portable volume, although the type in which it is printed is large enough to be comfortably legible. Mr. Laurence Gomme, in a short preface, makes the perfectly safe observation that a careful perusal of this volume will convince all interested in the government of London that it is a subject which needs a considerable amount of study in order to understand it. Messrs. Frederick Tarrant and Co., Ltd., of Camberwell, and Messrs. Edward Lloyd, Ltd., of 12, Salisbury Square, E.C., are the publishers, and the price is 7s. 6d. net.

Mr. Nettlefold on Housing.*

The largest opportunities for social betterment are no longer enjoyed by the hygienist pure and simple—like Simon, or Playfair, or Benjamin Ward Richardson—but by the architect who has absorbed and assimilated their teaching and traditions. But, with all his knowledge and skill, the architect is seldom the prime-mover in such matters; he can expect to do but little more than supply what is demanded of him. Hence he is apt to feel particularly grateful to those meliorists who, like Mr. J. S. Nettlefold, are doing effective work in educating the public mind, and stirring the public conscience to a more enlightened apprehension of the varied and momentous issues involved in the housing problem. Herein is seen the chief value of the book under notice. It appears to represent an enthusiastic missionary effort. Its price—1s. net—when compared with its size and quality, seems to preclude all possibility of pecuniary profit; and from this and other indications it would appear that the chief aim in issuing the book is to spread broadcast the pure gospel of housing reform. The conscientious builder, therefore, ready and anxious to do better work than has been hitherto required of him, will heartily welcome this volume as an augury of dawning reform. It is, of course, well known that, unlike many another social reformer, Mr. Nettlefold is by no means a flabby sentimentalist. As the very title of his book would suggest, he believes in practicality. On the other hand, it would be unjust to say that he belongs to the "philanthropy-and-five-per-cent." school of thought: all he requires is a sound, safe, permanent four-per-cent. investment! Sensibly enough, he insists on establishing betterment on a firm and permanent business basis; and he holds that the substitution of homes for hovels, of wholesomeness for squalor, can and should be effected in such a way as to pay the property owner, besides yielding the community an immeasurably rich return in improved health, decency and pleasure. Among the forty plates and other illustrations in the volume before us, one of the most interesting is Dr. Ludwig Hercher's ideal town plan; but the views and diagrams showing actually accomplished methods of converting slums to respectability may perhaps possess more practical value; and the resuscitation of Sir Christopher Wren's town plan for London is justified by the topical interest of the subject, and by the fact that the grand old architect anticipated many of the ideas of present-day town-planners.

House at Hidcote, Chipping Campden, Gloucestershire, for Major W. Wright,
E. Gabriel Stevenson, Archt., 143 Cannon Street, E.C. and Chipping Campden, Glos. March 1908.



This house, which is now nearing completion, is built of brick, covered with cream-washed fine-cast, the dressings being of Campden stone. The staircase portion is covered externally with oak boarding. The roofs are covered with red sand-faced tiles. Messrs. Espley and Co., of Evesham, Worcestershire, were the general contractors.

One of the most valuable chapters in the book is that in which the housing powers possessed in other countries are summarised and compared. But the book is replete with useful information upon almost all aspects of the many-sided housing question. It might easily have become an exceedingly dull book; from which fate it is happily redeemed by the author's shrewd perception and breezy style.

*"Practical Housing," by J. S. Nettlefold, Chairman Birmingham Corporation Housing Committee, and Chairman Harborne Tenants, Ltd. Letchworth: Garden City Press, Ltd. Price 1s. net.

Concrete Country Residences.

The second edition of a profusely illustrated brochure on "Concrete Country Residences" has recently been issued in America by the Atlas Portland Cement Co. Whilst we may pass, without comment, the statement made in the descriptive letterpress which accompanies the photographic plates that "the observing builder has come to acknowledge the superiority of concrete from the viewpoints of economy and comfort," we are not at all convinced by an inspection of the examples of design given that "the combination of the three essentials which Vitruvius, the ancient authority on architecture, lays down as the qualities indispensable to a fine building—stability, utility, beauty"—have been secured. It is claimed for the concrete-built house that it is proof against the destroying elements of frost, flood and flame, that its walls are rendered warmer in winter, cooler in summer, and more completely sanitary than those built with any other material, and that, should it be regarded merely in the light of an investment, "a concrete building will be found to outclass all others, since it retains its original value for centuries, while other forms of construction rapidly depreciate." Attention is also drawn to the fact that in the great conflagrations of Baltimore and San Francisco the concrete structures remained practically unharmed, whereas buildings constructed of other materials were completely destroyed. As to the various methods employed in the application of concrete to buildings, solid walls are used for factories, warehouses, and large structures in general, whilst "hollow" walls formed by two thin walls tied by concrete piers placed at regular intervals are considered to offer the best form of construction for all climates as preventive either of excessive heat or extreme cold. We are also told that hollow concrete blocks are favoured by many builders, and that stucco applied over rough stone or brickwork, and wood and metal lathing, is now very extensively used. But whatever may be the merits of concrete as a building material pre-eminent for its stability and durability, we doubt whether it will find universal favour until its architectural treatment becomes somewhat more than a mere travesty of past styles of art. For instance, the Hotel Blenheim, Atlantic City, N.J., which is illustrated on the first page of the brochure, is so hopelessly vulgar in conception and design as to be beneath criticism, and while good planning is in evidence in the residence designed by Messrs. Carrère and Hastings at West End, New Jersey (and what is much more to the purpose, the architecture is to a certain extent suggestive of the material employed), the majority of the designs illustrated are very little above the architectural level of the small suburban houses and "desirable" villas of the speculating builder, upon which, indeed, many of them appear to be modelled. It is hinted in the printed matter that the so-called "Mission architecture," low-roofed, picturesque and suggestive of lower California "in the romantic Spanish period," is the correct style to adopt in the design of a concrete residence. After a careful re-examination of the farrago of Italian villas, Georgian and imitation "half-timbered" houses, and the nondescript bungalows and cottages illustrated in the publication now under review (most of which appear to us to be architecturally altogether unsuitable for concrete construction), we are strongly inclined to endorse the opinion that is thus somewhat cautiously put forward.

"The Charm of the English Village" is the title of a book Mr. B. T. Batsford will publish in a few days. It has been written by Mr. P. H. Ditchfield, M.A., F.S.A., and illustrated by Mr. Sydney R. Jones. The text and illustrations set forth the attractions of English villages—the old manor houses, the thatched and tile-hung cottages, the inns and shops, the churches and market-crosses, gardens, roads and streams. Archæology is left severely alone, and while in no sense a treatise on architectural design, the book deals with the achievements of the village mason and carpenter and blacksmith, showing how well and worthily they wrought in simple unaffected style, and produced buildings which form such a pleasing feature of the English landscape. The price of the book is 7s. 6d.

Law Case.

Law as to Movable Structures.—At West Ham Police-court recently, George Lewis, a fruiterer and greengrocer of Upton Park, was summoned by the West Ham Corporation for erecting a movable building without first applying to the local authority for permission to do so. Mr. Stephen Lynch, who appeared for the Corporation, said that the defendant, on the forecourt in front of his shop, had erected a structure on which he exposed his fruits, etc., for sale. The whole of the forecourt was occupied, and on Saturday nights the defendant was in the habit of moving the structure, but on other nights he enclosed the sides and front. He was the leaseholder of the premises, and the line he took was that the erection was on his own forecourt, and that he was entitled to have it there. The West Ham Corporation Act of 1893, however, provided that persons erecting a movable building must first submit plans to the town council and get its permission. The point was, "What is a building?" and on that matter there are a number of decisions which leave no doubt about this structure being a building, and one which was not exempt from the provisions of the West Ham Corporation Act. A coffee-stall had been held to be a building, and so also had a wooden structure on wheels. The matter was important, for if every shopkeeper with a forecourt were to put out structures beyond the line of frontages of the buildings, some very awkward corners would arise, to the prejudice or danger of the public. Mr. Daybell, representing the defendant, emphasised the fact that the structure was on the defendant's own premises. The real trouble, counsel contended, was created by the corporation, who had put an electric standard in front of the defendant's shop, and had left but a few feet between the standard and the limit on the defendant's property. Recently this standard had been the cause of about 30 accidents.—Mr. Gillespie said that he must hold the structure to be a building within the meaning of the Act. He imposed a nominal penalty of 40s., including costs.

MODERN PLASTERWORK.

The illustration on the opposite page of some plasterwork executed by Mr. George Jack in the dining-room of a house at Minsted, Sussex, of which Mr. Mervyn Macartney is the architect, is one of a number of interesting examples given in the "Architectural Review" for April. The illustrations in question are the first of a series that will appear in our monthly contemporary, and in conjunction with them will be articles by well-known plasterworkers and other craftsmen whose opinion is of value. In this first article Mr. George P. Bankart and Mr. Lawrence Turner express their views on the subject, while in the May issue Mr. George Jack and Mr. Ernest Gimson will continue the discussion, and in the June issue Mr. Walter Gilbert (who has directed the plasterwork of the Bromsgrove Guild since Mr. Bankart left that body for London) will add his opinions, Mr. F. W. Troup contributing a "summing-up" based to some extent on the illustrations accompanying the articles, which include examples of work by many other plasterworkers than those named.

As pointed out in an editorial note to the first article, plasterwork is one of the building crafts upon which the past decade has dowered a fresh lease of life and energy, and, like leadwork, it owes its practical resuscitation to the efforts and enthusiasm of a comparatively small band of craftsmen. The craft of the plasterworker in its broad sense has never really died out, but its possibilities in the direction of artistic expression have been limited here for the best part of a century to the running of more or less intricate cornices and the production of ceiling roses as dangling points for gas pendants. Technical skill may never have been wanting, but to the present generation belongs the privilege of once more demonstrating what beauty and distinction may be imparted to a room by a well-considered scheme of the plasterer's art.

Notes and News.

The Piccadilly Hotel, which has been completed on the site of the old St. James's Hall and Restaurant, with a frontage to Piccadilly and Regent Street, is to be opened on May 6th. It is of vast size. In constructing it, 6,500,000 bricks have been used, enough to reach (an ingenious newspaper correspondent has calculated) from London to Budapest if placed end to end. In excavating for the foundations, which are 40 ft. deep, 60,000 cub. yards of earth were removed. This "mammoth" has also consumed 104,000 cub. ft. of Portland stone, 4,200 tons of Portland cement, 11,000 yards of wall-tiling, 7,000 tons of iron and steel work, 8,700 yards of asphalt flooring, 70 miles of electric bell wire, 200 miles of piping for lighting and heating, 90 miles of electric light and power cables, and 160,000 floor joists. The number of electric lamps installed is 16,000. The hotel contains 700 bedrooms. The

Photo: "Architectural Review" Photographic Bureau.

SOME PLASTERWORK BY GEORGE JACK IN THE DINING-ROOM AT "MINSTER," MINSTED, SUSSEX. MERVYN E. MACARTNEY, F.R.I.B.A., F.S.A., ARCHITECT.

water supply is derived from an artesian well, which, having been sunk to a depth of 400 ft., is capable of yielding 80,000 gallons per day. Messrs. William Woodward and E. A. Gruning are the architects, with Mr. R. Norman Shaw associated in regard to the elevations. The contractors are Messrs. Perry and Co.

A MEMORIAL WINDOW TO MR. AND MRS. GLADSTONE, from a design by Sir Edward Burne-Jones, is to be placed in the main chancel of the parish church at Hawarden.

THE FRANCO-BRITISH EXHIBITION.—May 11th has been mentioned as the date of opening of the Franco-British Exhibition. The Prince of Wales, who will be accompanied by the Princess, has consented to perform the ceremony.

MESSRS. WARING AND GILLOW are erecting pavilions at the Franco-British Exhibition for the following exhibitors:—Lipton's, Bovril, Atkinson's, Muratti's, and the "Daily Telegraph." The architects for Muratti's are Messrs. Fulton, and for the "Daily Telegraph" Mr. Reginald Blomfield; in the other three cases Messrs. Waring and Gillow are the architects, as well as the builders and decorators.

"THE ARCHITECTURE OF THESSALONICA" was the subject of a lecture delivered recently in the Gymnasium at Robert Gordon's College, Aberdeen, before the Aberdeen Architectural Association, by Professor Charles Gourlay, B.Sc., professor of architecture in the West of Scotland Technical College, who stated that he had been in Thessalonica in 1905. He gave an interesting description of various buildings, and showed plans and photographs illustrating the early churches, then the Byzantine churches, and subsequently the more modern ecclesiastical and other architecture.

THE MODERN CANTERBURY PILGRIM, who is very often a professional student of architecture, may like to know of the issue of "The Archer Guide to Canterbury" (London: 57, Shoe Lane, E.C.), which gives a useful summary, and some fair illustrations, of the chief objects of interest in the venerable and beautiful city. A map is included, and at threepence the guide is not dear.

THE NEW ST. JAMES'S HALL, London, which has just been opened, has been designed by Messrs. Joseph and Smithem, with advice as to the interior from Mr. A. Blomfield Jackson, and built by Messrs. Perry and Co. It is of Portland stone and red brick, and is in the English Renaissance style. It stands on an island site only about a hundred yards from the Queen's Hall, a spot once occupied by St. Paul's Church. All the windows of the hall are double, to keep out the noise of the street. The foundations of the building are 40ft. deep, and the roof is of concrete, in accordance with the London County Council's regulation; the structure is, indeed, believed to be the first to which this regulation has been applied. Forty thousand cubic feet of Portland stone, 287,000 bricks, 1,100 tons of concrete, three-quarters of a mile of marble, two miles and a quarter of wire and pipes, 30,000ft. of mahogany, and 130 tons of copper have been used in the structure, the cost of which is £100,000. The interior is fitted with about 1,100 arm-chairs, and underneath each seat there is a place for hat and coat.

MESSRS. CLARK AND CO., of 32a, Westminster Palace Gardens, S.W., have secured the contract for the plastering throughout with their "Xelite" fire-resisting cement for Messrs. Benson's new bank, 102 and 103, Bishopsgate Street Within, E.C. (architects, Messrs. E. N. Clifton and Son, F.R.I.B.A.). They have also just completed the plastering at the Baptist Church, Harrow (architects, Messrs. McKilliam and Proctor).

BRISTOL SOCIETY OF ARCHITECTS.—The following officers and council have been appointed for the coming session:—*President*, Mr. Mowbray A. Green (of Bath); *Vice-Presidents*, Mr. H. Dare Bryan and Mr. G. H. Oatley; *Council*, Messrs. G. C. Awdry, F. Bligh Bond, R. C. James, W. S. Skinner, Frank Wills, and J. F. Wood; *Associate Members of Council*, Messrs. G. C. Lawrence and T. H. Weston; *Hon. Secretary and Treasurer*, Mr. W. L. Bernard.

THE FIRST BUILDING FOR THE ALDWYCH SITE, which has for so long lain vacant, will be that in which the offices of the Agency of the Government of Victoria will be housed. That State has acquired a plot having a frontage of about 30 ft. to the Strand, and on it will be erected a structure of five storeys. Portland stone is to be mainly used in the facade, which will be in conformity with the general architectural scheme adopted

along that side of the Strand. At the side, to the extent of about 80 ft., a private roadway is to be made, to be called Melbourne Place. It is anticipated that, when completed, the building will cost £20,000. The work of excavation preparatory to laying the foundations has already been begun by Mr. James Carmichael, the contractor who has been appointed to carry out the work. In addition to the offices for the Agent-General and his staff, the building is to comprise public reading-rooms, libraries, and show-rooms for demonstrating the resources of the colony to the general public.

SOME FINE FRESCOES which adorn the vast cupola of the Church at Loreto, and which have cost seventeen years of labour and a sum of £32,000, have just been exposed to the view of the public for the first time. The dome was erected by Giuliano da Sangallo in 1500, and its redecoration became necessary owing to the destruction wrought by Napoleon's soldiers. The frescoes are the work of the Sienese artist Cesare Maccari, and contain about a thousand figures; the main idea being derived from the Litany. The work is very favourably judged by Italian critics.

GLASGOW BUILDING TRADES INFIRMARY COLLECTIONS.—A meeting of representatives of the building trades convened by the Glasgow and District Building Trades Infirmaries Collections Committee was held recently for the purpose of endeavouring to induce the whole building trades to combine in one general scheme for the collection and allocation of the subscriptions received from workmen for infirmaries and other institutions. Mr. M'Neil, vice-president of the Master Masons' Association, occupied the chair. The following resolution was adopted: "That this meeting is unanimously of opinion that the union of the building trades in one general committee to control the various infirmaries' collections would be beneficial alike to the workmen concerned and the various institutions which benefit, much more so than by the individual systems now in vogue; that the various Associations represented at this meeting do all in their power to further this end; and that copies of this resolution should be sent to each trade."

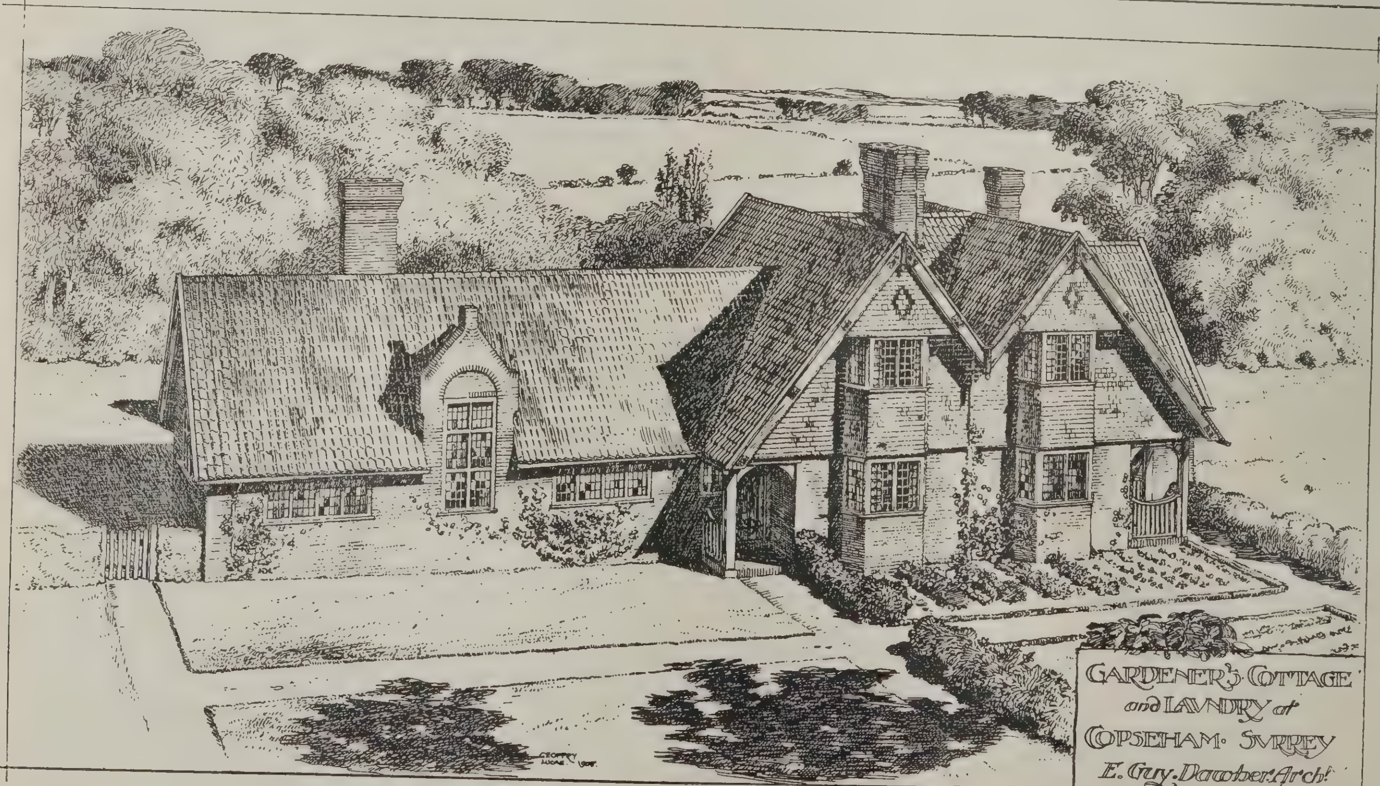
THE RELATIVE SIZES OF CATHEDRALS in Great Britain and Ireland are stated as below by a newspaper correspondent. It will be seen that York is the largest, that St. Paul's is the next in order, and that these are followed by Lincoln, the area of which is approximately 50,000 sq. ft. The area of Canterbury, which possibly comes next in order to Lincoln, is not specified. Chester is comparatively small.

	Sq. ft.
York	63,800
St. Paul's	59,700
Lincoln	50,000
Ely	46,000
Durham	44,400
Canterbury	——
Worcester	33,200
Gloucester	30,600
Chichester	28,000
Bristol	22,556
Ripon	25,280
St. David's	21,950
Carlisle	15,270
Southwark	17,113
Manchester	18,000
St. Patrick's, Dublin	21,300
St. Asaph	11,600
Llandaff	15,440
Bangor	10,650

Winchester is the longest cathedral, and in this respect is followed closely by St. Alban's, which is 550 ft., Winchester 556 ft. (exterior), Ely 537 ft. (exterior), Lincoln 482 ft. (interior).

A NEW RESERVOIR FOR CHINGFORD, for the Metropolitan Water Board, was formally begun recently by Mr. E. B. Barnard, M.P., vice-chairman of the Board, cutting the first sod at Ponder's End. The work is a continuation of the scheme for a chain of reservoirs extending from Walthamstow to Enfield Lock. The one in course of construction will hold about 3,000 million gallons. The water area will be 416 acres, and the length of the embankment will be 4½ miles. The works will require about 15 million bricks, 158,000 cub. yards of concrete, etc., will cost £340,859, and will take about four years to complete.

THE IDEAL SIZE FOR THEATRES.—The comments of the New York Press on Mr. Granville Barker's refusal to entertain the idea of managing the millionaires' theatre in New York are of considerable practical interest. Mr. Barker objected to the plans of the new theatre, the foundations of which are already laid and cannot be altered, on the score of its being too big. In a book on "A National Theatre," of which Mr. Granville Barker is part author, an auditorium seating 1,500 is held up as an ideal. As far as seating capacity is concerned, that is between the Shaftesbury (1,800) and the Duke of York's (1,300). There is reason to believe that the Théâtre-Français and the Odéon do not seat more than 1,200 spectators. The ideal theatre would hold as big an audience as is compatible with distinct hearing, clear sight, and that sense of intimacy which is required for modern plays. It appears that the new theatre in America is to be built on a big plan, suitable only for spectacular drama or for opera. We shall have to face that difficulty here in due course, and "E.A.B.," the dramatic critic of the "Daily News," confesses that he is entirely at one with Mr. Granville Barker. It would be ridiculous in these days to build a national theatre which would be of no use for modern drama, when it is modern drama that we especially wish to lift to a higher standard. And as Mr. Barker and Mr. Archer have pointed out, you can stage Shakespeare in a medium-sized theatre, but you cannot stage modern drama in a big theatre. The great point is that the space behind the proscenium should be large enough. Moreover the spectacular view of Shakespeare and the loud ranting of his verse are just the bad qualities of modern productions we wish to reform.



(Royal Academy Exhibition, 1908.)

Correspondence.

Ilford Emergency Hospital Competition.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—We feel sure there must be many competitors for the above hospital besides ourselves who would wish some expression of satisfaction to be placed on record concerning the decision of the governors to appoint Mr. Percy Adams as the assessor in succession to Dr. Green.

This result has been attained through the intervention of the R.I.B.A., which apparently suggested the appointment of an architect as joint assessor with the doctor, and it is significant and exceptional that the advice of the Institute has been so well received, for it commonly happens that such representations, however tactful, are either ignored or treated with discourtesy.

In regard to Dr. Green's voluntary withdrawal from the assessorship, the profession should recognise and give him credit for a lofty disregard of his own interests, and a public-spiritedness which is equally commendable. We doubt whether the Institute desired, or even hinted at, his retirement, as his exceptional knowledge would have been of invaluable assistance to his co-assessor.

We are among those who believed there was every wish on the part of the promoters of this competition to conduct it in a straightforward manner, and although the conditions were in some respects unusual, there was internal evidence of this intention. It is perhaps unfortunate, therefore, that your correspondent, whose letter appeared in your issue of April 1st, thought it well to write in so provocative a manner.—Yours faithfully,

FREDERICK CHATTERTON, A.R.I.B.A.
WILLIAM E. COUCH, A.R.I.B.A.

Obituary.

MR. ERNEST CARRITT, A.R.I.B.A., F.S.I., district surveyor for Finsbury, died in London on April 16th.

MR. G. GARD PYE, a past vice-president of the Society of Architects, died on Easter Sunday, aged 59.

MR. J. ARTHUR HOPE, for many years one of the leading directors of the well-known firm of art metal workers, Messrs. Henry Hope and Sons, Ltd., of Birmingham, died on April 11th.

Notes on Competitions.

National War Memorial, Cardiff.

The design submitted by Mr. Albert Toft for the national memorial to Welsh soldiers who fell in the South African War was selected on Wednesday last by the assessors, the Earl of Plymouth and Mr. George Frampton, R.A. The memorial is to be placed near the City Hall, Cardiff. It will cost £2,000.

Secondary School, Lowestoft.

Mr. A. Morris Butler, assessor in the competition for a secondary school for 300 boys and girls to be erected at Lowestoft, has placed first the design submitted by Messrs. Brown and Burgess, of Ipswich, and second that submitted by Mr. R. Scott Cockrill, of Lowestoft. The assessor's award has been adopted by the Education Committee.

Shakespeare and Calvin Memorials.

Just now there are two international competitions for memorials before architects and sculptors, namely, the Shakespeare Memorial, and the Calvin memorial at Geneva, the available funds for each of which are at present in a state of uncertainty. The conditions of the competition for the Shakespeare memorial are, we understand, at present under revision, and they may be expected shortly. For this proposed memorial it is hoped to raise the sum of £100,000, while for the Reformers' Memorial at Geneva the available sum is estimated at £20,000. This latter memorial is to include the statues of Calvin, Farel, Knox, and Beza, and to be surrounded by other statues of great men connected with the movement. A sketch and a plaster model, together with plans and sections are required, and these have to be submitted by September 15th next. The designs are to be adjudicated upon by a jury comprising the following: M. A. Bartholomé, Paris; M. Ch. Girault, Paris; Professor Tuaillon, Berlin; Professor Bruno Schmitz, Berlin; Mr. George J. Frampton, R.A., Hon. A.R.I.B.A., London; Professor Gull, Zurich; M. Alfred Cartier, Geneva; M. Horace de Saussure, Geneva; and the chairman of the Association du Monument de la Réformation, Geneva.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
May 1	ENLARGEMENT OF PRINCESS ALICE HOSPITAL, EASTBOURNE.—Limited to local architects. Premium £25. Particulars from J. H. Silkstone, 6, Bedfordwell Road, Eastbourne.
May 1	FARM BUILDINGS.—Premiums £50 £25, £15 and £10. Particulars from Thomas McRow, Secretary, R.A.S.E., 16, Bedford Square, W.C. Summary in BUILDERS' JOURNAL, March 25th.
May 8	DOOR AND WINDOW FITTINGS.—(Assessors, Mr. Henry T. Hare, F.R.I.B.A., and Mr. Leonard Stokes, F.R.I.B.A.). Premiums of 15, 5 and 3 guineas. Particulars from N. F. Ramsay & Co., 1, Victoria Street, Westminster.
May 14	SCHOOL AT KINGSDOWN, BRISTOL (to accommodate 500 children).—Limited to local architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May 15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May 20	SCHOOL AT BRIDLINGTON.—Limited to local architects. No premium. Particulars from G. G. O. Sutcliffe, Quay Road, Bridlington.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model.
1909. Jan. 1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date: final competition to be limited to six competitors.
Date not yet fixed.	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall Eccles, Lancs.
No date.	ELEMENTARY SCHOOLS AT APPLEBY AND TEBAY. Particulars from C. J. R. Tipper, Secretary, Westmorland County Education Committee, Lowther Street, Kendal.
No date.	NEW PARISH COUNCIL CHAMBERS, Motherwell. Premiums, £20, £10, and £5. Conditions from Alex. Bryden, Parish Council Offices, Motherwell, N.B.

"LESSONS FROM A RETROSPECT."

At the annual general meeting of the Edinburgh Architectural Association held last Wednesday, Mr. Hippolyte J. Blanc, R.S.A., the retiring president, took as the subject of his valedictory address "Lessons from a Retrospect." To no profession or calling, he said, was the past of so much value as to the architect. Nothing revealed the every-day life of a people so fully as did the material evidences left them in the shape of architectural achievements It was not necessary in their every-day practice that all their new work should savour of the archæological encyclopædia. Neither should it give evidence of its author having regardlessly run away from traditions, leaving a doubt regarding the next line of development.

The Later Freaks in Architectural Art had not much, if anything, to recommend them. Their compositions disregarded all principles. While of this desire of novelty they might unfortunately have to endure more samples, for a time, the practice, not being based upon any principle, was evanescent. The "new art" was the offspring of a restless mind, prematurely thrust out from the architectural schoolroom. The lesson from the more scholarly practice, as well as from the threatened deviation from it, would seem to be that they were better able to develop along the lines of consistent continuity.

Architectural Teaching in Schools.

Dealing with education in art, Mr. Blanc said that to make architecture a useful factor a knowledge of it should be implanted early in life, and it should form a part of every-day school instruction. Could not something be done among children at school to enlist their sympathy in the nobility and beauty of architectural achievements? Let a portion of the year at present devoted to sports be set apart for the practice of other pastimes such as would furnish the mind for the greater enjoyment of business life and the periods of leisure in travel; and no better subject than architecture could be selected for this end. What was required was the education of all to the value of art as a national system.

Modernity in Edinburgh.

Edinburgh, said Mr. Blanc, was unique as a city, and its early modern architects proved themselves in their art. Why did later modernity flaunt some of the commercial architectural abandonments so regardlessly in the best sober thoroughfares?

The present-day cry was for garden cities; but in planning a city a first consideration must be convenience for its commercial intercommunications. This facility of intercourse should not be hampered by a too-frequent intrusion of so-called garden amenities, else no reasonable compactness would be possible.

The "City Beautiful"

should be their name and aim. Few cities afforded better examples than did Edinburgh of the two modes of how a city ought to be laid out, and how it ought not to be. The New Town was the result of a carefully considered scheme, but in the later suburban extensions there was no pre-arranged scheme. How could such erratic planning breed anything else but squalor and slum?

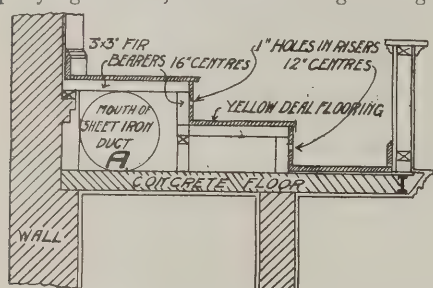
(Mr. Blanc is succeeded in the presidential chair by Mr. John Watson, F.R.I.B.A.; Mr. James B. Dunn, F.R.I.B.A., being the new vice-president.)

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
The querist's name and address must always be given, not necessarily for publication.

Effect of Hot Water on Woodwork.

LONDON.—W.J.R.B. writes: "In connection with the combined warming and ventilating of a hall, I intend driving warmed fresh air in winter and cold in summer along the space underneath the side balconies marked A on the accompanying section, the air diffusing through

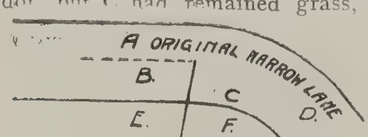


1in. holes bored in the risers of the tiers. This air, which will be at a temperature of 100 to 120 degs. Fahr. and not likely to exceed 140 degs., will be in direct contact with the wood supports for a few hours every evening in winter time whilst the hall is being used. Will this warm air in time be detrimental to the strength of the wood supports, or cause dry rot to set in? Perhaps it may be objectionable from an insurance point of view. The heater is a considerable distance away from any of the woodwork."

If the wood be sound at first, its strength will not be lessened, though if it be, whilst sound, not quite dry, the joints will shrink or open in erratic ways, and the top tiers may even sway a little under the load, though quite strong enough to support it. Dry rot will not grow whilst the heat is dry. It is the wet heat of steam or fumes, etc., such as are found in laundries, dye-works and similar places, that perishes the roof timbers. Excessive shrinking is all there is to fear from the hot dry air in your case: and this requires sufficient doors to allow the easy sweeping-out of all the dust that settles through the cracks during the nights. The insurance people will object, not so much to the wood of the air-duct becoming dry as to the duct acting as an air-blast in case any of it, or any other part of the building, be kindled. If a shutter be fitted to the fan mouth, you have ground to claim a reduction of premium. INGENIOR.

Liability for Repair and Maintenance of Sewer.

F.M. writes: "A client built on land BE, and by conditions of purchase widened the 15ft. lane A to 30ft., by adding B to it. Previous to this (for perhaps 25 years) the lane further up, at CD, had been widened to 30ft. by the vendor, but C had remained grass, and

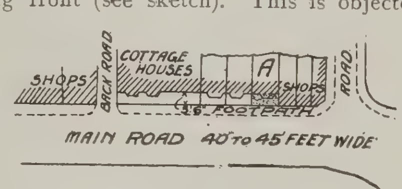


had never been dedicated to the public. The owner, however, had not at any time restricted access to C, and having recently sold F to another client he did not attempt to sell him the half road C, as the public had gone over it uninterruptedly. The council have recently extended their sewer to D at their own cost, to take drains from F. (1) Are the council liable for repair and maintenance of C? (2) If not, who is? Is the owner of E liable for maintenance of B?"

(1) I am of opinion that the district council are in no way liable for the maintenance, or for the making up, of the lane. Unless they have formally "taken it over," they cannot well be liable for it, and the fact that they have laid the sewer has no bearing upon the case. (2) Probably no person has hitherto maintained the surface of the lane, and therefore no liability can attach to any one in particular. The former owner appears to have granted rights of way over the land, and the present owners of those rights of way are only entitled, so far as he is concerned at least, to pass over the land in whatever condition it may be. I imagine that when the question of the making-up of the road becomes urgent the district council will put in force their powers under the Public Health Acts, and will call upon every frontager to pay his proportion of the cost of road-making in accordance with his frontage thereto. F.S.I.

Right to bring Building Line Forward.

BURSLEM.—CONSTANT READER writes: "A plan has been deposited with a local surveyor for bringing forward an existing front (see sketch). This is objected



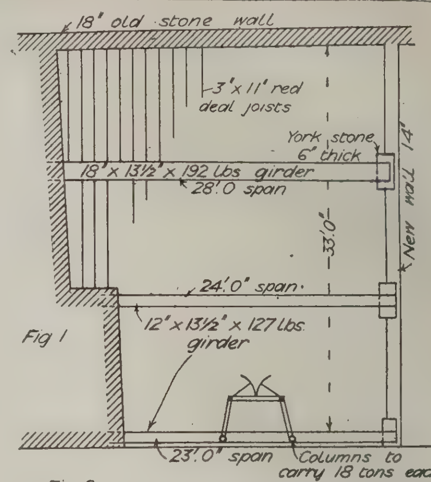
to by a member of the building committee. Can such objection be confirmed by law? Have I not a right under the Public Health Act to come forward to the building line at each end of the terrace? A is the house I desire to bring forward. The set-back is 5ft. 6ins. from the line of projecting shops at each end of the terrace, and when brought forward would occupy the present area space, which is dotted over on sketch. The premises are at present used as a shop, and my client is desirous of enlarging the area of same."

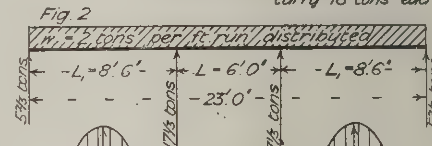
The sanitary authority may pass such a plan if they choose, but you certainly possess no legal right to bring forward the building line beyond that of the building on either side of your new premises. You do not in this respect overstep the mark so far as the "shops" are concerned on the one side, but you certainly are not justified in coming further forward than the line of the cottage fronts on the other side, unless by special permission from the sanitary authority. F.S.I.

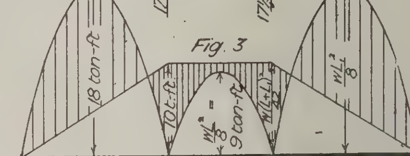
Girders for Showroom Floor.

DORSET.—An Old Subscriber writes: "What load can I safely put on a floor constructed as shown by the accompanying sketch (not reproduced)? The showroom over the shop is for furniture."

The plan of the showroom, with altered walls and piers, is shown in Fig. 1. The red-deal joists, 11ft. span and 15ins. centres, will carry a safe distributed load of $\frac{bd^2}{L} = \frac{3 \times 11^2}{11} = 33$ cwts. over an area of $11 \times 1\frac{1}{4} = 13.75$ sq. ft.







giving the safe distributed load per ft. super. as $\frac{33}{13.75} = 2.4$, say, $2\frac{1}{2}$ cwts., which is a usual allowance. The load on the 28 ft. span girder will then be $28 \times 11 \times 2\frac{1}{2} = 770$ cwts. = 38.5 tons, requiring Redpath, Brown and Co.'s No. C.2256, 18ins. wide by 13½ins. deep by 192lbs. per foot run compound girder. The load on each support $= \frac{38.5}{2} = 19.25$ tons, which at 12 tons per sq. ft. on York stone requires $\frac{19.25}{12} = 1.6$ sq. ft. bearing area, and the girder will therefore have to extend say 13½ins. on the stone, and at 4 tons per sq. ft. on brickwork $= \frac{19.25}{4} = 4.8$ sq. ft. area of York stone, say 3ft. by 1ft. 6ins. This necessitates the alterations shown in Fig. 1, and the wall must be increased to 14ins., with piers 3 ft. by 9in. projection under the girders. The proposed girders 11 ins. deep would not be stiff enough, and the above girder 13½ins. deep is still below the usual depth for the given span. The load on the 24ft. span girder will be $24 \times 11 \times 2\frac{1}{2} = 660$ cwts. = 33 tons, requiring Redpath, Brown and Co.'s B.2256, 12ins. wide by 13½ins. deep by 127lbs. girder, and this may have the same bearing area as the last. Considering the girder over the shop front as having no support from the columns, it will have a load of 46 tons and will require to be the same section as the 28ft. span girder, but if the two columns are assumed to take their maximum load without the slightest settlement, then the conditions of the case will be as in Fig. 2, and the bending moment diagram Fig. 3. From this the maximum bending moment is 13 ton-ft., giving a tabular value of $13 \times 8 = 104$, which is given by a B.S.B.13, 8 ins. by 5ins. by 28lbs. single rolled steel joist. As the conditions will be somewhere between these two cases, the section B.2256 adopted for the 24ft. span may also be used in this case, but the columns and foundations should be designed for the full load of 18 tons each.

HENRY ADAMS.

Calculating Stresses in Ring.

MANCHESTER.—RETLAW writes: "Ten tie-rods are connected to a centre ring as shown in the accompanying sketch, each rod having a tensile stress of $18\frac{1}{2}$ tons. What is the greatest tensile stress on

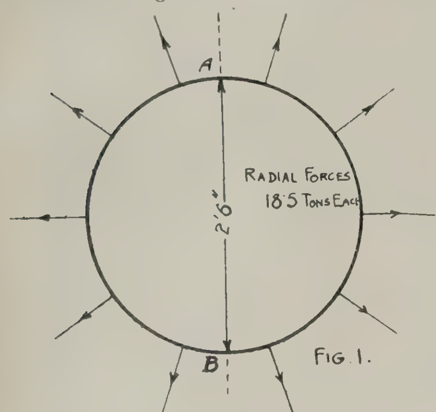


FIG. 1.

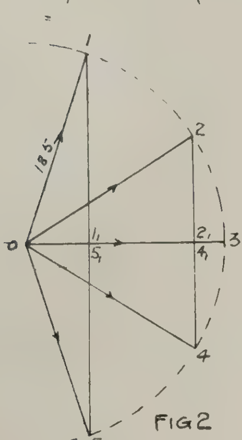


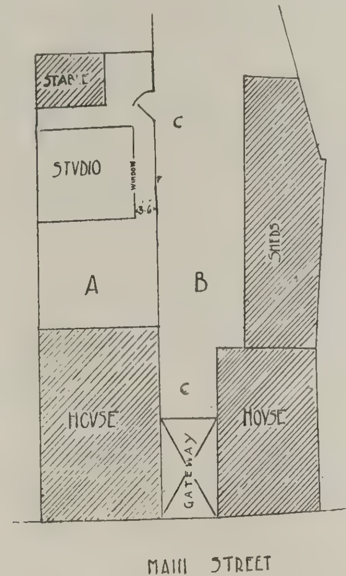
FIG 2

the ring, and what area of metal would be required for a tensional stress of 7 tons per sq. in.?"

The approximate stresses can be found by the following method. Consider the section as at AB (Fig. 1), and take the forces to the right of the section. Resolve these forces perpendicular to AB as shown in Fig. 2, where 01, 02, 03, 04, 05 represent the forces. The total force perpendicular to AB is equal to $01_1+05_1+02_1+04_1+03$. The force amounts to 60.9 tons. One half of this is carried by the ring at A, and one half at B. Therefore the necessary area of ring $= \frac{30{\cdot}45}{7} = 4{\cdot}35$ sq. ins. This calculation neglects the bending stresses that occur owing to the ring being curved instead of straight between the forces, and not being pin-jointed at the forces, as would be the case in a theoretical frame. Such bending stresses would be troublesome to calculate accurately, and in this particular case are not very important, as the tendency is for the ring to straighten between the forces, and this would reduce the stresses to the amounts found by the approximate method that has just been shown. The method would be quite accurate if the number of forces were increased indefinitely. A.

Right of Light.

WATFORD.—H. O. C. writes: "The owner A of the house shown in the accompanying sketch has a right of way CC over B's premises to a stable. A erects a studio as shown, with a window looking over premises B. The owner of premises B objects to the window, and demands recognition of right to light by the payment of a nominal rental. Failing such payment, can the owner of premises B erect a board, or a loft with a cartway

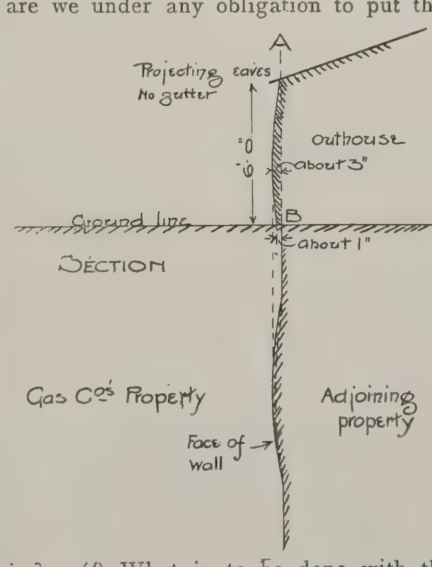


under it, adjacent to the fence F, to obscure or obstruct the light?"

I advise A to enter at once into the agreement for which B asks. B has a perfect right to erect a board on his own premises, thus blocking the light to the new window, and there is nothing to prevent him from building the loft, or any other structure he chooses, provided, of course, he does not obstruct A's right of way to his stable. F.S.I.

Boundary Wall Rights.

CAMBRIDGE.—E.J.H. writes: "We are about to build new premises abutting on some old cottage property, the boundary wall of which is irregular and bulges, as shown on the accompanying sketch. What is the correct mode of procedure in a case of this kind? (*a*) May we cut the wall to the straight dotted line A B in sketch? (*b*) Can we compel the owners of the outhouses to rebuild or straighten the wall? (*c*) Are we under any obligation to rebuild the wall? It will be noted that the tiles of these outhouses project on to our ground. (*d*) Can we cut these tiles off? (*e*) Can we compel the owners of outhouses to put in a proper gutter, or are we under any obligation to put this



in? (*f*) What is to be done with the rainwater from the roof? I presume we are not compelled to take it. The ground on which it is proposed to build is a field, and has only recently been acquired by us, and the adjoining property is rather old."

What evidence have you that the land is your freehold right up to the face of the boundary wall of the adjoining property? You will probably find, by digging, that the footings of your neighbour's old wall project quite as far as the roof does, and it is quite conceivable that the narrow strip of land belongs to the owner of the cottages. However this may be, and assuming the land *is* yours, the owner of the cottages has yet a prescriptive right (acquired by user for a period exceeding twenty years) to all the matters of which you speak, "encroachments" though they may have been in the first instance. The answers to your questions then are, specifically:—(*a*) No. By cutting back the wall you would certainly commit an act of trespass. (*b*) No. The wall has no doubt been in its present state for a period of more than 20 years past. (*c*) No; and what is more, you have no right to do so (unless by permission). (*d*) No. The tiles are, I presume, as old as the rest of the building. (*e*) No. (Answers *c* and *d* apply to this point also). (*f*) You are compelled to take the rainwater in the same way as it has been taken in the past—the easement has been acquired by twenty years' user, exactly as in other cases. I can only advise that you should come to an agreement with your neighbour. In such a case it should not be a difficult matter. F.S.I.

ARCHITECTURAL GRANITE.

(Continued from p. 256, No. 684).

In the table published on the two following pages, we have brought together all the information we have as to the strength of granite. The available information, however is scanty, and some of the results are open to the gravest suspicion, for the reason that the conditions of the experiments were not such as to give accurate results, and the lines upon which the tests were conducted were such as to provide information of little value, and likely to prove misleading. We have supplemented the information with the results of experiments conducted abroad upon American and Continental granites, so as to provide readers with a truer knowledge of the nature of granite, and to enable them to scientifically use the material in construction.

In the case of the experiments of Profs. Hudson Beare and Bauschinger, and those on American granite, the specimens were prepared with plaster of Paris, so as to give an even bearing, and these results may be considered reliable as regards compressive strength, but where the test specimens were (as is usual) cubes, instead of the height being $1\frac{1}{2}$ times the width, the values should be reduced as stated in the preceding article. Where such accurate values are not obtainable in connection with other important granites, we have given the best figures available, but they must be looked upon with some suspicion, although they have practical value if they are treated with caution and allowances made in connection with the foregoing remarks.

We may add to these data the information that in regard to the granite from Brandford, Conn., U.S.A., the ratio of lateral expansion to longitudinal compression was $\frac{1}{4}$, while the coefficient of expression in water was .00000337398.

(To be Continued.)

Strength (in tons per sq. ft.) and other Properties of Granite.

Kind and Variety of Material and Name of Quarry.	Density (Specific Gravity.)	Weight per cu. ft. in lbs.	Absorption of Water Per cent. of dry wt. absorbed	Compression.						Shear.		Bending.				Tension				Authority.
							Coefficient of Elasticity.							Coefficient of Elasticity.				Coefficient of Elasticity.		
				Crushing Stress of Cubes.	Crushing stress of Prisms shaped 1:1:1½	Direction of Pressure.	1st Time Load Applied.	Reapplication of Load.	Range of Stress (Tons).	Shearing Stress.	Direction of Shearing.	Coefficient of Bending Strength.	Direction of Pressure to Bed.	Value.	At a Stress of (Tons).	Tenacity	Direction of Pull.	Value.	At a stress of (Tons.)	
GRANITE.																				
West of England —Penryn	2.65	165.4	0.12	1060.2			—	—	—											Beare
Cornish Grey	2.59	161.7	—	955.9			463,500	538,300	64.3 to 514.3											do.
Aberdeenshire —Corennie	2.61	162.9	0.38	1234.3			—	—	—											do.
Ditto	2.55	159.1	0.42	1318.3			523,600	540,700	64.3 to 514.3											do.
Cove	2.71	169.1	0.55	987.1			—	—	—											do.
Kemnay	2.58	161.0	0.21	1211.1			—	—	—											do.
Peterhead	2.54	158.5	0.29	1207.7			644,000	657,000	64.3 to 514.3											do.
Dyce	2.65	165.4	0.19	1105.8			587,600	621,400	64.3 to 514.3											do.
Hill of Fare	2.57	160.4	0.40	1360.3			381,000	460,400	64.3 to 385.7											do.
Sclattie	2.58	161.0	0.10	850.5			266,000	321,700	64.3 to 257.1											do.
Persley Grey	2.60	162.3	0.19	942.8			522,300	—	64.3 to 514.3											do.
Rubislaw	2.62	163.7	0.09	1289.7			445,000	525,200	64.3 to 385.7											do.
Ben Cruachan	2.75	171.6	0.29	876.9			—	—	—											do.
Mount Sorrel				832.																Fairbairn Kirkcaldy
Norway—Standard Grey		167.0		1240																do.
Labradorite (Emerald Pearl and Royal Blue)		168.0		1908																
Sweden— Carnation		168.0		1687																do.
Bon-Accord Red		168.0		1668																do.
Ruby Red		168.0		1657																do.
Germany—Bavaria—Waldstein (light-grey)	2.64			1472 1371		‖ ⊥														Bauschinger.
Kornberg (blue)	2.67			1883 1659		‖ ⊥														do.
Schneeberg (light grey)	2.61			1334 1225		‖ ⊥														do.
Metten (light coloured)	2.66			1379 1398		‖ —														do.
Ditto (dark coloured)	2.64			1226 1234	832 —	‖ ⊥	264,146 244,038		2.7 4.61	88.6 9.1 87.7	⊥ ‖ Transverse ‖	105 87.7	— Trans. ‖	212,962 129,734 191,940 125,218	2.2 100.5 2.2 85.9	39.7	‖	216,618 53,926	2.5 34.7	do.
Vilshofen	2.67			2011 2012		‖ ⊥														do.
Fürstenstein (light coloured)	2.69			>1737 1700		‖ —														do.
Ditto (dark coloured)	2.76			>1865 1882		‖ ⊥														do.
Gefrees	2.75			1590 1608		‖ —														do.
Kittlmühle bei Passau	2.70			1289 1234	847 —	‖ —	113,336 199,252		1.37 411.3	93.2 54.8 82.2	⊥ ‖ Transverse ‖	76.7	Trans. ‖	104,196 40,216	4.1 73.1	43.8	‖	101,454 28,334	.6 32.9	do.
Gefrees, bei Berneck in Oberfranken (grey, very rich in mica, fine-grained)				923		⊥				31 34.7 69.5	⊥ Transverse ‖ ‖	69.5	Trans. ‖							do.
Fürstenstein, bei Passau (yellowish fine-grained)				777 >914		⊥	186,402 168,176		0.1 9.1 to 182.8	74.9 91.4	⊥	84 91.4	⊥ Trans. ‖			20.1	‖	137,100 457,000	0 to 4.57 ¾ breaking load	do.
				804 >905		‖	263,232		0 to 182.8	57.6 54.8 68.5	Transverse ‖ ‖	86.8 91.4	‖			17.3	⊥	109,680 36,560	0 to 4.57 ¾ breaking load	
Selb in Oberfranken (very coarse-grained grey)				727 753		⊥ ‖				33.8 41.1 52.1	⊥ ‖									do.
Hauzenberg, Niederbayern (coarse-grained yellowish)	2.68			868		⊥				36.5	⊥									do.
Do. (coarse-grained yellow)				914		⊥														do.
Do. (black and white of mean coarseness)				>932* >941*		⊥ ‖	457–408,558 435–304,416 584,960 447,860		9.1 9.1 to 182.8 9.1 9.1 to 182.8	116 85 65.8 77.7 117 99.6 82.3	⊥ Tranverse ‖ ‖	191.9 169.1 136.2	⊥ Trans. ‖ ‖			40.7 29.7	‖ ⊥	466,140 228,500 246,780 45,700	0 to 4·57 ¾ breaking load 0 to 4.57 ¾ breaking load	do.

Do. (very fine grained dirty yellow)				822.6	⊥				77.7 59.4 55.7	⊥ Transverse ∥. ∥									do.
Reuth im Fichtelgebirge (dark-coloured black and white of mean coarseness)				831.7	⊥														do.
Louisenburg im Fichtelgebirge (very light coloured, rather fine grained)				996.2	⊥														do.
Waldstein, near Weissenstadt im Fichtelgebirge (very light coloured, rather coarse grained)				1307 777 >914	⊥ ⊥	176,402 168,176		9.1 9.1 to 182.8	74.9 91.4	⊥	84.1 91.4	⊥ Trans. ∥			20.1	∥	137,100 45,700	0 to 4.57 ⅔ breaking load	do.
Fürstenstein, by Passau (yellowish, rather fine grained)				804.3 905	∥	263.232		0 to 182.8	57·5 54.8 68.5	Transverse ∥. ∥	86.8 91.4	∥			17.4	⊥	109,680 36,560	0 to 4.57 ⅔ breaking load	do.
Cham (white, very hard, rather fine-grained, for paving only)	2·60			1280 1426	— —	251—378.396 graduallyrising 694,640					128.	—							do.
Nabburg (blue, very hard, fine grained, for paving only)	2.69			1179 1361	— —						197.4	—							do.
Kirchenlamitz in Oberfranken) (very coarse - grained, yellowish)				1179 764	⊥				29.2 25.6 32.9	⊥ ∥									do. do.
Wunsiedel (coarse-grained, yellow)				978 1051	⊥ ∥				61.2 91.4	⊥ ∥									do. do.
Austria—Scheerding am Inn (very dark, hard)				1316	—														do.
Switzerland–St. Gotthard-Tunnel 1·5 m. from Nord-portal (very hard, coarse grained)				722 813	⊥ ∥				43.8 70.3 100.5	∥ Tranverse ∥.	84	∥			24.6 20.1	∥ ⊥			do.
Ditto —200 m. from Nord-portal (very hard striped)				>1005 850	⊥ ∥				127 109.6 85.9 98.7 49.3 38.3	⊥ Tranverse ∥. ∥	178.2	Trans. ∥			34.7	∥			do.
United States—Milford, Mass. (pink granite)		161.9		1220.6		329-657 467,530		64.3 to 128.6 385 to 514	143.7 184.6	One surface sheared Two surfaces sheared	Max. Fibre St. Tons per sq.ft 112.2								Watertown Arsenal.
Rockport, Mass.		161.5		1264.7		428,430 612,244		64.3 to 128.6 643 to 771	100		154.8								do.
Troy, New Hampshire		164.7		1682.8		292,204 494,505		64.3 to 192.9 450 to 578.6	142.3	One surface sheared	—								do.
Brandford, Conn.		162		1007.8		535,712 584,415		64.3 to 192.9 450 to 578.6	117.8	One surface sheared.	—								do.
SYENITE.																			
Wolsau, Bavaria	2.92 2.94 2.90			1691 1727 1755	∥ ⊥														Bauschinger
Woelssau bei Radwitz im Fichtelgebirge (very dark green with a little grey)	2.98			>1261*	⊥				177.3 243.1	⊥									do.
Ebendaher (black and grey with very little green)	2.94			>1270*	⊥				127.9	⊥									do.
Ditto. (black with much grey)	2.84			1234	⊥														do.
Little Rock, Ark., U.S.A. (light syenite)						446,785		6.4 to 321.4											Water-town Arsenal
Do. (dark syenite)						524,571		6.4 to 321.4											do.
DIABASE.																			
Ochsenkopf	2.95 2.96 2.98			2340 2577 2413	∥ ⊥ ⊥														Bauschinger
GNEISS.																			
Kistna Bridge, India				787–1930															Unwin
BASALTS.																			
Penmaenmawr		160		1086															Fairbairn
Hornblendic Greenstone				1580															Wilkinson
Felspathic do.				1106															do.
QUARTZ.				1270															Mallet.

* Were not crushed at this load.

CONTRACTORS' SECTION

(MONTHLY.)

THE NORTHERN & SOUTHERN METHODS OF SCAFFOLDING.

A Comparison, with Some Details.

By A. G. H. Thatcher.

The aim of this article is to present a survey of the systems of scaffolding used in the northern and southern parts of the country, such details and illustrations being given as are necessary to elucidate the contrasts and similitudes that may be noted. To those who, by want of travel or other reasons, have little knowledge of scaffolding other than that coming within their own cognizance, the effect may be instructive. The object of the comparison is, however, more material. It has long been felt that the means of erecting buildings have proceeded along too conservative lines. Change has not been welcomed, and any innovation or attempt at such has usually met with a storm of destructive criticism, which in some cases has undoubtedly been justified, and in others has greatly delayed the general use of what has eventually proved to be an advantage.

Objections to New Methods.

In the case of a totally new departure this, perhaps, if not justified, is not open to severe condemnation. A change of method often entails expense, and in few cases can a builder be blamed for caution before entering upon a pecuniary outlay until the advantages to be gained are plainly manifest. On the other hand, the same objection to change is noted even where the new in one locality is old and tried in another, and this seems unreasonable, provided all other considerations, such as adaptability, are equal. It is hoped that a review of the many means of erecting and repairing buildings will have an effect in lessening objections to methods which have long obtained, assuming, of course, that the builder can see that reasonable grounds exist for a change.

The chief question which a contractor would consider before authorising an experiment would undoubtedly be that of cost. This must not, however, be taken in its narrowest sense, namely, that of first outlay for purchase of material, for the speed with which scaffolding can be erected, its capacity for continuous use, its life and adaptability, are all comprised within the term.

Speed of Erection, and Continuous Use.

Speed of erection is governed largely by the proficiency of the workmen employed. It is quite probable that at first any novelty would cause a loss in comparison with the results that would afterwards accrue, but as this would be of a temporary nature only it need not form a serious objection.

The capacity of plant for continuous use is an item that would affect a builder carrying out large and, therefore, generally lengthy operations. It is very seldom indeed that material which is new and sound at the commencement fails to complete the job, and more especially is this true of such details of the scaffolding as are not disturbed in position when once fixed.

Scaffold boards may perhaps be excluded from this statement, but subject as they are to the roughest of usage, their constant replacement affords a ready means of calculating the cost of renewal; and their general use on all kinds of work prevents this from being a point which would affect a builder's judgment when deciding the style of scaffolding to be adopted.

The frequency of use of any plant depends largely upon the owner's business. A general builder undertaking any class of erection should have no fear in adding serviceable material of any description to his stock. A firm principally engaged in repairs would probably fight shy of buying anything which would only be useful in new erections. The system of hiring plant, however, comes in here, and this possibility does away with serious objection to new methods.

The life of scaffolding material depends largely upon the two previously-mentioned considerations—the continuity and frequency of its use. It is, therefore, obviously difficult to give definite opinions as to the life of plant of this kind; it must remain a matter for decision by the builder, who must necessarily understand most entirely the requirements of his own business.

Adaptability.

The adaptability of scaffolding for different purposes requires undoubtedly the most careful consideration. The nature of the material used in the building, the extent of the works, the necessities of the various trades which have to be provided for, are all points to be arranged and adjusted. Perhaps it is these difficulties that account for the disinclination to alter systems which are approved by custom. Nevertheless, a contractor should, by keeping an open mind, be always prepared to adopt methods which offer a reasonable improvement on those he is in the habit of carrying out.

All these matters, therefore, have to be borne in mind when calculating the cost of suggested improvements. The primary outlay is entirely a matter for the builder as I must depend largely upon the length of his purse. This being so, for the purpose of this article, it must be assumed that new methods can be adopted, provided that the initial outlay can be recovered by speed of erection, a more continuous or frequent use, an increased longevity, and greater adaptability to circumstances and requirements.

The "Scotchman."

A careful consideration of the north and south country systems of scaffolding brings to notice that each has some definite points of resemblance, even in the small matters of detail. There has of late years been some overlapping of methods, and in no case is this more apparent than in the use of the derrick staging. This is now an everyday feature on buildings in the south, although owing its origin to the north, which is shown by the common appellation of "Scotchman" given to it in London and the home counties.

The "Scotchman," the ordinary design of which is too well known to need an illustration, has several variations in the north which, so far, have not been seen in general use elsewhere. Although offering one of the best means for the transport of material, it has its limitations, the principal one being that its use is confined within the effective length of the jib, or, if built square on plan, to the two jibs carried on opposite angles. This in many cases is sufficient, but where the building is of considerable length and where, say, in the erection of a block of flats it is not necessary to keep the building at approximately one height as the work proceeds, the demolition and re-erection of the derrick creates an expense that can be avoided. Fig. 1 shows the Scottish method of doing this. The legs are mounted upon a travelling bogie, and rails are laid to correspond. The queen or back legs are connected at the base by a suitable timber which prevents them opening out or closing when the propelling power is exerted. This arrangement has to be fixed on the outside of the building, and is more suitable for small derricks than large.

This improvement, however, has not been allowed to rest here, although it has been left to London to show the way. In the erection of the new Government offices in Whitehall, now approaching completion, a framed erection was put up which not only allowed the crane to travel at a considerable height, but was erected within the building. Figs. 2 and 3 are elevations, front and end, of the design used. It stood until the roof was reached, and no difficulty was experienced in handling material.

The framework in this case was a fixture, the rails being laid on the top runners, and the wheels fitted under the sleepers connecting the guys to the base of the crane mast. The dead load carried

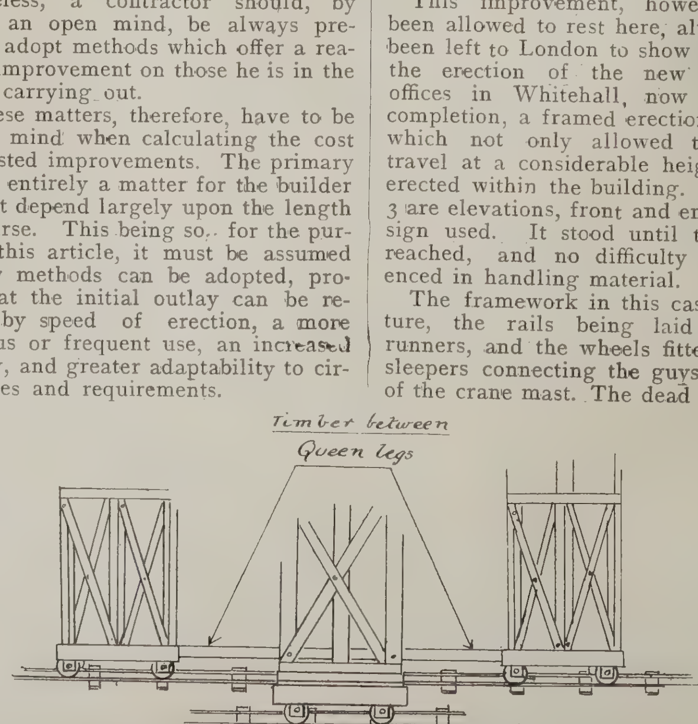


FIG. 1. TRAVELLING BOGIE FOR "SCOTCHMAN."

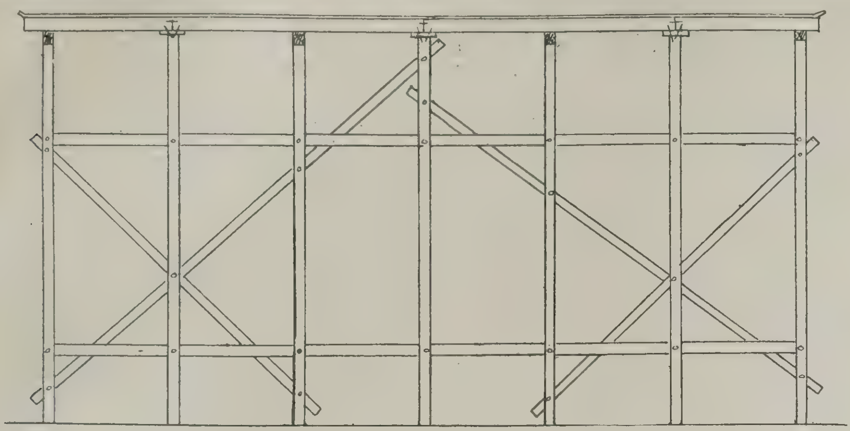


FIG. 2. DERRICK STAGING TO CARRY TRAVELLING CRANE: FRONT ELEVATION.

by the ordinary type of "Scotchman" at the bottom of the queen legs was here placed on the crane platform near where the guys were anchored.

Another type of derrick staging

suitable for small jobs is shown in Fig. 4. The "Scotchman," as usually seen, is built up of comparatively small scantlings bolted together, but in this case whole timbers are used as far as possible. This, by allowing of other use of material in a wider sphere, must prove an advantage to the contractor, because it is well known that timber when once cut into small sizes suffers considerable loss in value. Apart from this, the fewer parts make for speed in erection, a fact which, provided no loss of adaptability or strength ensues, adds to its worth. This design is entirely northern, but should be very suitable for small buildings in any locality.

Pole Scaffolding.

Pole scaffolding is entirely an English method, being practically unknown in

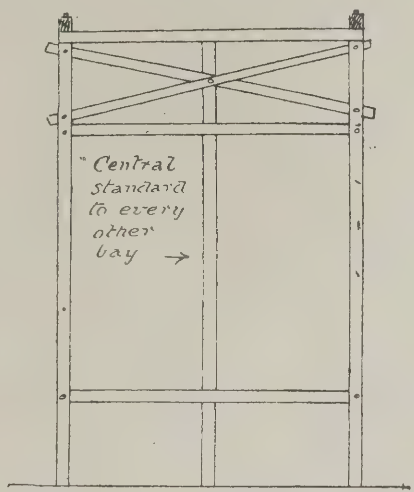


FIG. 3. DERRICK STAGING TO CARRY TRAVELLING CRANE: END ELEVATION.

The Gabbard System.

In the gabbard type the needles carry the boards, and, framed as they are to the standards, any breakage would have serious results. Further, the distance between the supports to the boards is fixed by the distance between the standards, the boards having, therefore, to withstand a greater strain. This is compensated for by the use of thicker boards, those of 3 in. thickness being general instead of the 1½ in. used on pole scaffolds. Both of these methods are used for stone buildings, and if the thinner boards are considered of insufficient strength for this purpose they are laid double.

The needles in the gabbard system can also be strengthened, as shown on Fig. 7. It is impossible to add to their width without altering the scantling of the battens used in the standards, but an adjustment in the lap of these timbers allows a greater depth to be given, or two may be fixed, one above the other.

The framed scaffolds are often erected inside the building, most of the Scottish work being done in this way. They are erected by the joiners, and are of battens 6½ ins. by 2½ ins. For greater strength deals 7 ins. by 3 ins. can be used, the whole being bolted together. For mason's work three battens are used in the standards, as already shown, but for lighter work two battens only may be used, the connection with the needle being strengthened by a cleat (Fig. 8). Similar scaffoldings to these are used by painters when dealing with the walls of high buildings.

Scottish builders claim that these scaffolds are quicker to erect than pole scaffolds. An instance which supports this view occurred in Liverpool some time ago. A local firm of builders found

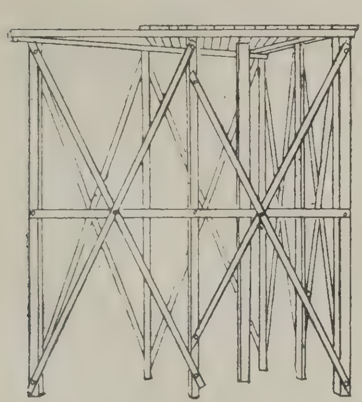


FIG. 4. DERRICK STAGING BUILT UP OF WHOLE TIMBERS.

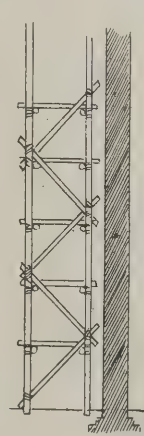
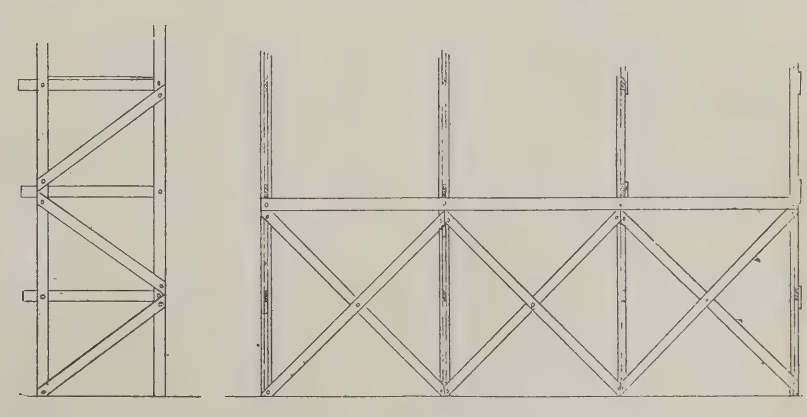


FIG. 5. MASON'S POLE SCAFFOLD.



End Elevation. Front Elevation.

FIG. GABBARD SCAFFOLD.

Scotland. It has there, however, its counterpart in the system of framed scaffolding known as the gabbard, and also in the method of erecting platforms known as the iron needle gabbard. The mason's pole scaffold and the gabbard most nearly approximate, both being of the independent variety, as will be seen by Figs. 5 and 6. The pole scaffold has standards, ledgers, face bracing, and cross bracing of spruce fir, having an average diameter of five or six inches, and all connections are made of rope-wire or hempen. The platform boards are supported on birch putlogs placed as near together as may be necessary. The strength of the erection itself in no way depends upon the putlogs, so that if they should fail the scaffold itself should stand

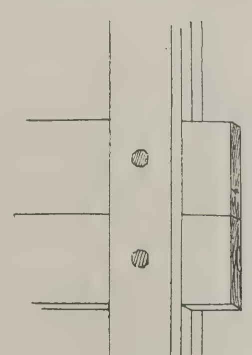


FIG. 7. METHOD OF FIXING DOUBLE NEEDLE.

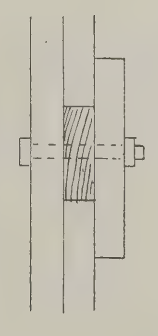


FIG. 8. USE OF CLEAT TO SUPPORT NEEDLE.

it was impossible to carry out certain pole scaffolding in order that the work could be done in time. A Scottish firm was approached, the gabbard system was adopted, and the work was completed and the scaffolding removed according to contract.

There is also a certain adaptability about the gabbard which is worthy of note. As is well known, the face of a building is not always continuous in a straight line. It is possible with the gabbard system to continue the needles through the frame of the scaffold towards the wall being erected, and if this is done where any slight set-back occurs in the building line the platform can be brought closer to the work without any alteration in the line of the scaffold. No undue strain is thrown upon the needles

if the projection is not carried too far. With the case of independent pole scaffolding, at least the inner line of standards would have to be altered, thus increasing the distance the putlogs would have to span.

Bracing.

The gabbard bracing is generally of 6 in. by $1\frac{1}{4}$ in. flooring boards. Apart from this, all the parts are of regulation size, and are, therefore, interchangeable. In this respect no advantage is gained over the pole system. In preparing material for the gabbard, no doubt a greater expense is incurred, all sawn timbers being used. Against this expense may be urged the ease of handling the smaller parts, which, as already mentioned, gives a greater speed in erection. Again, pole scaffolds require greater and constant attention during use, owing to the nature of the rope connections. Although by reason of the use of whole timbers they may be stronger, it is more difficult to pick out defective parts, which are generally disclosed by the saw.

The reliability of bolts is beyond question, and the ease of fixing when new is in their favour. The rough treatment of usage prevents their having so long a life as would be expected, the threads being the first to go. Hempen ropes suffer also greatly from rough usage, and probably as a method of connection there is little to choose between them; in any case, they have to follow the system of scaffolding, bolts being used for rectangular and ropes for spherical timbers.

Scaffolding for Stone Buildings.

Bricklayers' pole scaffolds are of the dependent type; that is, a certain support is required for their erection, and this is gained from the wall of the building. It is a system of insufficient strength for

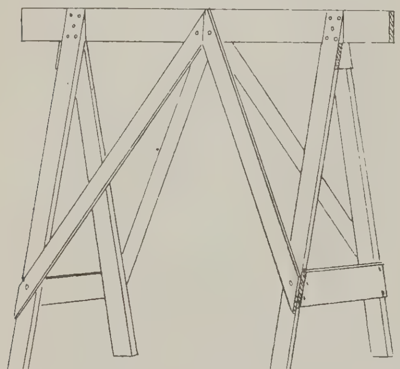


FIG. 9. SCOTTISH TRESTLE.

stone buildings, and, apart from this, impossible to erect in such cases, as in stonework no opening can be left for the insertion of the putlog without leaving a defacement in the wall. In the north, however, a method of scaffolding exists for rubble buildings which is of the dependent type. A standard is erected in the same manner as for the gabbard type, and the needle is let into the wall in the same way as the putlogs with the southern system. A variation is to be seen in the Dundee district. The timber needle is dispensed with, and an iron bar about 2 to $2\frac{1}{2}$ ins. by $\frac{5}{8}$in. thick is used in its place, the bar being driven on edge into the joints of the wall to a distance of about 6 ins. and wedged in place. To allow of this the joints of the stonework must be from $\frac{1}{2}$ to $\frac{3}{4}$ in. wide. This system is largely used for repairs, pointing, and dressing, and for such work is undoubtedly suitable, no great weight being carried. It must be less costly than the erection of the dependent pole scaffold, and is easy to erect and dismantle. To the southern ideas the use of metal bars is decidedly an innovation.

The width of platform given on these gabbard and similar scaffolds is about 6 ft., being, therefore, wider by about 1 ft. 6 ins. than on the pole scaffolding. This extra width is useful to the Scottish mason, as it enables him to dress such stones as are used for rubble walling without being unduly limited for space.

Trestles.

Scottish builders make a considerably greater use of trestles to form scaffolding than seen in the south, where they are used principally by painters and plasterers. The trestles, however, are of a different design, the Scottish trestle most nearly approximating to those used by the south country carpenters. In actual size many are much larger. The Scottish system of building, as is well known, is from the interior. As each floor is reached the joists are put in and planked over where necessary, the trestles being carried up from floor to floor. The first trestles are usually of a height of 6 ft., others of less height being added as the work proceeds. The system of erection is as follows:—The 6 ft. trestles carry the main platform, which in Glasgow consists of deals 9 ins. by 3 ins., and 12 to 14 ft. in length. On this further trestles are raised, 5, 4, or 3 ft. in height, as the work demands, each height being planked over as it is reached. The platform on each set of trestles is at least as wide as the height of the trestle on which it rests. The outside plank is nailed to the trestle head, or a strap of wood can be nailed on instead, to keep all the planks in their place. The best practice is for the trestle scaffolding not to exceed a height of about 16 ft. If anything above that height is needed the gabbard is called into use.

All the necessary parts of this arrangement are supplied by the joiners, and put together by the masons' labourers.

A sketch of this trestle is shown in Fig. 9.

The trestles are placed from 6 to 10 ft. apart. In Dundee the platform boards vary from those used in Glasgow, battens $6\frac{1}{2}$ ins. by $2\frac{1}{2}$ ins. being used, and they vary in length up to 18 ft. When more than one length is required they are lapped. The whole gives a sufficiently wide platform for the men, and can also carry material. The southern painters' trestles are arranged for a platform two boards wide; that is to say, such a width can be obtained, but often one board only is used.

The use of trestles by masons and bricklayers generally throughout the country is not likely to occur while the system of working from the exterior remains in vogue. Nevertheless, the method is a handy one, easily built, and, provided the plant is in good order, one of considerable strength. The life of a trestle, of course, varies, but with proper care and repair, instances have been known where they have lasted for ten years.

(To be concluded.)

The Latest "Largest Skyscraper in the World," the new Hudson Terminal Building, New York, will house 10,000 tenants. The building has fifty-two lifts, which are run like a railway system, with a regular force of starters and signalmen.

YORKSHIRE FEDERATION.

The monthly meeting of the Yorkshire Federation of Building Trades' Employers was held at Selby on Thursday last under the presidency of Mr. J. Biggin, of Sheffield. Representatives from the various centres in the county were present.

It was reported that letters on the "Dangers attendant upon Building Operations" had been sent to the Home Secretary by the Barnsley, Scarborough and York Associations.

A letter was read from the Home Secretary stating that a builder is *not* required to make any return of compensation under section 12 of the Workmen's Compensation Act in respect to building accidents, even though these accidents may occur on premises which are, for certain purposes, treated as factories in pursuance of the provisions in section 105 of the Factory and Workshops Act.

The minutes of the Lancashire, Cheshire and North Wales and Northern Counties Federations were read. The president stated that at the last meeting of the Northern Centre a resolution had been passed that the three Federations forming the Centre should be requested to pay a commuted subscription of £400 instead of furnishing wages returns. There were 19 elective representatives on the Centre Board, and on the basis of representation the quota of the Yorkshire Federation would be 5-19th, namely £105 6s. 8d.

The Federation agreed to pay for the present year a subscription of £105 6s. 8d. to the National Federation, being the proportion of a commuted subscription of £400 from the Federations forming the Northern Centre.

Mr. H. Naylor, on behalf of the Halifax Association, invited the Federation to hold the next meeting in that town. The invitation was cordially accepted, and the meeting fixed for Thursday, May 21st.

Mr. Jas. Townley, of Hull, organising secretary of the National Federation of Slate Merchants, and editor of the "Slate Trades Gazette," contributed a paper on "The Evils of Trade Competition," a full abstract of which is here given. In view of the agitation which is effervescing throughout the trade, this contribution comes very opportunely.

THE EVILS OF TRADE COMPETITION.

By Jas. Townley.

Competition in connection with the building trades of this country has grown up with the industry until it has come to be regarded as an integral part of our life; and in this respect the building trades differ very largely from many other methods of gaining a livelihood, even where transactions are of equal volume.

It is, perhaps, an easy matter for us who are engaged in building operations to persuade ourselves that, as a community, we are the greatest possible sufferers, and daily subjected to the most irksome and unfair conditions that can be imposed upon civilised man. The constant wail of building contractors, and their associates, against the results of everyday competition leave the public to imagine that we (the contractors) are the only victims to circumstances extant. Let us pursue our theme, however, and see how far our conditions of life are self-imposed or obligatory.

Gambling among Contractors.

It might assist our reasoning a little to attempt some kind of definition of the

terms "Contractor" or "Competitor." Is either of these terms synonymous with gambler or speculator? True, the word "gambler" does not sound quite so euphonious as the word "contractor:" yet there does seem to be much in common in the principles governing both. With each there is the element of uncertainty largely influencing their actions. The calling of each is, to say the least, very hazardous, and largely precarious. The gambler who parts with his money gets no equivalent: so with the contractor who sinks money in a contract. Yet, with the personal knowledge I have of the contractors in this country, far be it from me to dub them as gamblers in anything like the sense by which we generally understand that word. It might be to our advantage as contractors, however, could we, as an organisation, prevail upon the Government to pass such an Act as was passed against gambling some 385 years ago, which provided that anyone convicted of losing £10 at one time, or £20 within four hours, should be fined five times that amount for the benefit of the poor. What better antidote could we have against undue competition than to fine each contractor making a loss on his contracts five times the sum lost, for the benefit of our National Federation's reserve fund? In such circumstances we should hear very little about our loss on contracts, for higher prices would soon obtain.

The Main Causes.

Competition in the building trade has become more common during the past 20 or 30 years, and to-day it is looked upon as indispensable. This leads us to ask, What are the main causes responsible for a practice that has long ceased to be healthy or advantageous to the contractor? Is it that this individual has become untrustworthy, and no longer regarded as a fair-dealing tradesman, or is it that the public have discovered the great possibility of having a building erected below cost by reason of the number and the quality of contractors who are ever ready to enter the arena, and who, by reason of their lack of capital, business training and technical knowledge, prove themselves altogether incompetent for the important position they attempt to usurp? I am inclined to the belief that more contracts are rendered unremunerative because of this class of contractor than by the efforts of the more *bona-fide* builder.

Another evil, distinctly observable, is the readiness—the keenness—with which proprietors accept the lowest estimate sent in, regardless of the competitor's status or past achievements. This eagerness to fasten upon an unduly low price submitted is so noticeable as to suggest a rapacious longing to gain something without giving an equivalent, for this is exactly what a proprietor does who accepts a tender and enforces its execution when *prima facie* the work cannot be completed for anything like the sum submitted.

The Federation and it's Principles.

As a federation of contractors we should have a periodical stock-taking. The strength of our Federation must not be gauged by the regular attendance of executive members at our monthly meetings, for these are only evidences of the existence of a greater body, and this greater body—the Yorkshire Federation, or even the National Federation, is only as strong as its weakest point. That our organisation should be strengthened and consolidated is, I take it, the wish of all, and to this end we must ever direct our efforts. The evils which we are now considering are not all to be found outside the influence of this Federation, but more generally within. We preach "Preference" and "Intertrading," but can we boast of really giving "preference" to each other, and does the intertrading rule dominate our daily actions? When we can answer these questions in the affirmative, then we shall find our Federation sought after by those firms who to-day hold aloof from us. All this has a bearing upon unhealthy competition, for while the trade remains a disorganised body, competition will continue unchecked and uncontrolled.

Contractors and Sub-Contractors.

Other evils arise when a contractor secures the whole of the work, and then fails to accept those sub-contractors whose prices he has used to bring about his own success; or, before accepting them, places them for a second time in competition. Also there is cause for grievance when a full contractor neglects to hand over to his sub-contractor the proportion of money received on his behalf. A full contractor, I contend, has no right, moral or legal, to retain the money which rightly belongs to another, and to use it for an indefinite period in his own business, without asking consent. This practice is far too common to-day, even in Yorkshire, and deserves most drastic treatment. Some day I hope it will be found possible to place these defaulters under the law applicable to a trustee, and then the punishment will be more commensurate with the offence. On other shortcomings of the contractor and sub-contractor towards each other we need not enlarge, for they are but of a minor character.

Amongst other things I hope for (though do not expect to see this side of the millennium) is that when a building requires erecting, or other work has to be done, the proprietor will select his contractor just as he selects his architect, and they together bargain for the work required to be done. Where the work is of exceptional character, they invite a limited number to submit estimates, each competitor to receive a premium for the trouble imposed upon him.

The Surveyor's Position.

Then, again, we have the surveyor. His special duty is to check all accounts and figures appertaining to a contract, and to decide what amount the proprietor shall pay for extras, or what he shall claim for deductions. Why not have a surveyor retained by the contractor, and recognised by agreement with the proprietor, and whose duty it should be to go through the contractor's figures, and where deviations have been carried out at a loss, to amend such figures to a profitable transaction? To-day the principles of equity and justice are very largely absent from most building contract agreements.

The Overstocked Building Trade.

The subject of my paper being the outcome of a circular note addressed to the members of this Federation, which submitted to us, as a remedy for present-day unhealthy and ruinous competition, the adoption of higher prices, you may be looking to me for some expression of opinion on that semi-official note. We must all feel grateful to those friends in the trade who, actuated as we know them to be, by the highest motives, have given so much time and thought to the bettering of the condition of their fellow-tradesmen. Their findings, however, have not resulted in any practical solution of our difficulty, and considering the perplexity of the question, we are not greatly astonished.

To express my personal view, I should say that the difficulty confronting us, and its remedy, lie far deeper than our friends appear to have gone. The building trade in this country in its normal state is not by any means sufficient for the requirements of the vast army of traders who are daily clamouring for an existence: and the facility of entrance into the trade is far too easy ever to hope that a better state of things may some day exist. From close observation I do not hesitate to say that, in the best interests of individual and community, one half of present-day building contractors should retire from what to them is a most irksome pursuit; for it must be apparent that about one-half of the competitors to-day are totally unfitted for the position they hold. They lack the essential business training and those common amenities by which they secure the favour and patronage of others, their methods of executing work are obsolete, and their exchequer is so impoverished that in the light of reason they cannot hope to succeed.

Ethics of Price-Cutting.

We have acquired the habit of censuring everybody except ourselves for the cutting-down of prices. We constantly aver that this or that firm cannot make a profit at their contract price, and others say the same of us; yet, generally speaking, we go on living, and working, and competing, with all the effrontery of successful men. We far too often argue from the standpoint that all contractors are equal, and adopt identical methods of procedure, whereas the very opposite is the fact, and very different results are achieved by different people who start from the same standpoint. With self-preservation as the first law of nature, we must not expect this inherent quality to become subservient to the dictum of fellow competitors, or even to the ruling of a federated body. One competitor is not likely to do anything tending to reduce his chance of success while so many brother competitors are ready, willing, anxious, to rush in and destroy any effort he may feel inclined to make towards a reform of any kind. To simply advocate the raising of prices as a remedy to distressed conditions, while the constitution of the building trade remains as it is, is simply to check legitimate enterprise, and to encourage a greater number of unemployed operatives or co-operative workers to start out in pursuit of the larger game which their deluded eyes imagine they see as the result of becoming their own masters.

Charges Laid at the Architect's Door.

Seeing that I have already advocated a sort of peaceful persuasion in reforms wherein our friends the architects are affected, it might seem a little incongruous for me to place at their door responsibility for many of the evils which come to the contractor by reason of the competition into which he enters, yet such unfortunately is the case, and our efforts as a federated body should be directed to minimising all evils thus arising. To say that there is one condition in every agreement—and a vital one—which has never yet been carried out by an architect, might, in the strict letter of such statement, be proved incorrect, but it would not be untrue to say that every architect in England continually contravenes his own agreement

and causes monetary loss to his contractor for which to-day there is no redress. I refer to the granting of certificates, and especially to the final certificate. In this particular I have not found even city architects or other corporate officials exempt. I submit that the handling of his money on the day it falls due is not only of immense moment to the contractor, but has an important bearing on the financial result of a contract, often little understood by the man who has made no study of finance. Every building contract agreement should provide that whenever the final or other payment becomes due, and is not at once paid over, interest at the rate of 15 per cent. should begin. Why should a contractor provide money, free of interest, which should be found by the proprietor? Or, again, why should a contractor be deprived of his money (when due) for any period without receiving compensation for such convenience as he thus renders to the proprietor or to the architect? Stress of business on the part of an architect, or absence from home, whether in pursuit of business or pleasure, should not be admissible in defence of non-payment to the contractor. While architects are allowed to be the sole arbitrators of their own doings, and contractors quietly submit to flagrant wrongs imposed upon them, they must not complain of unremunerative contracts.

Another evil which I would lay at the door of most architects is one that strikes at the root of the entire question. Wherein lies the cause of unhealthy competition, and why are contracts in the main rendered unprofitable? My answer is because of the vacillating and compromising character of architects themselves. A milk-and-watery sort of architect induces speculation on the part of the contractor, who plays upon the prospect of varying the specification, and thus securing a profit which he hopes may not be seen by a brother competitor. The habit becomes general, and the result debasing. An architect should specify what he means, and mean exactly what he specifies. If this be impossible, or difficult to be certain of, then the contractor should not be made to suffer in consequence, neither should he gain at the expense of the proprietor. A rigid specification faithfully demanded is in the best interests of the trade generally, for, deprived of the opportunity of making money out of a weak specification, prices would automatically stiffen, and tendering would approximate at least to a more legitimate practice.

There exist many other evils in trade competition, for which penalties are provided; hence I need not dwell on them here.

Had time permitted, I should have said a word on "competition as a natural outcome," comparing present-day methods with the Guilds of the Middle Ages, and the life and purpose of the Hanseatic League, in the history of which there are valuable experiences to be found; a study of which could not fail to prove of great interest to such a Federation as ours, who in a large measure are living over again the life of some of these organisations, which largely ruled the destinies of those countries in which they operated. Just as the strength of these defunct organisations became their weakness and ultimate downfall, so will it be with the Federation we now seek to uplift, and with which we are identified, unless we learn the important lesson, usually ignored, of placing the correct estimate upon victory, which in some measure we have achieved, but not yet completed.

THE NORTHERN COUNTIES FEDERATION.

Quarterly Meeting.

The quarterly meeting of the Northern Counties Federation of Building Trade Employers was held recently at West Hartlepool.

Finance.—The hon. treasurer (Mr. J. W. White) gave a report as to the financial position of the Federation, which showed, in addition to the amount on deposit at bankers, £20 12s. on current account and £59 18s. 3d. subscriptions outstanding for 1907. The Newcastle Association had paid the balance of their 1907 subscription, namely, £47 10s. It was stated that possibly the financial call on this Federation by the Northern centre might be increased by reason of the expenses of the secretary, as Mr. J. Tomlison had intimated his desire to resign his position as secretary for the Northern Centre Council. The president and two vice-presidents had been deputed to discuss the matter with Mr. Tomlison.

The matter of the subscription to the National Federation was discussed. Mr. J. W. White explained that the Northern Centre had decided to subscribe £400 this year instead of making a wage return. The subscription was based upon the number of representatives upon the Northern Centre; there are 19 representatives instead of 20 last year, when each Federation paid £20 for each representative upon the Council. This Federation has three representatives, and will contribute £63 3s., as against £60 last year. It was decided that the method of payment of this subscription be agreed to.

Regulations for the Prevention of Accidents in the Building Trades.—This Federation and the affiliated local Associations had memorialised the Home Secretary with respect to the proposed regulations, and in support of Mr. Geo. Macfarlane's report. Mr. Gladstone is fully occupied just now. It was mentioned that Mr. Shepherd had expressed approval of much contained in Mr. Macfarlane's memorandum. The Northern Centre had appointed the president and two vice-presidents as a deputation to wait upon the Home Secretary.

The draft proposals for bringing the recommendations of the Executive Council of the National Federation before the members and representatives of the local Associations were read, and on the proposition of Mr. J. W. White, seconded by Mr. H. McNaughton, it was resolved: "That as soon as the recommendations and agenda to be submitted to the National Federation were received, a copy should be forwarded to the local Associations, and that the president consider and decide whether a meeting of this Federation should be called."

The Sweated Industries Bill.—The secretary read the operative part of the Bill with respect to "Sweated Industries" which allowed six persons to apply to the Home Secretary for an enquiry to extend to any industry not named in the Bill, which might prove a source of great irritation to employers and this Federation. A letter had been written by the secretary to 29 Members of Parliament in the Counties of Durham, Northumberland, Cumberland and Westmorland, pointing out that this Bill should be amended so as not to apply to industries wherein the employers and employed, acting through accredited representatives, have entered into agreements or working rules dealing with wages and hours of labour, and asking them to support such amendment to exempt such industries in which mutual arrangements already exist. Replies had been received from members saying such was not the intention of the Bill.

A letter issued by the Lancashire and Cheshire Federation *re* ruinous and cutting prices was read, and it was decided that a copy be forwarded to each of the local Associations for consideration.

"Railways and the Building Trade."—THE BUILDERS' JOURNAL had asked this Federation for information upon the hardships that the different trades experience in connection with transit charges, etc., of various railways. A Parliamentary Commission had been appointed to enquire into the matter, and the names and addresses of likely informants had been supplied. It was decided unanimously: "That the local Associations be asked to secure from their members any evidence bearing upon this important matter, and, in the event of its being thought well, to submit the names of any members who would give evidence."

It was decided that this Federation should write opposing the Coal Mines (Eight Hours) Bill.

It was stated that the Preston employers had given notice to all trades (bricklayers excepted) to extend the walking time boundaries.

In regard to the strike of shipwrights, etc., in the Tyne and Tees and Hartlepool districts, the Administrative Committee of the National Federation were of opinion that no sides should be taken by setting on strike hands, or by paying off any of their own hands, but that they should remain quite neutral, in view of the Boards for the settlement of disputes now in operation with their workmen.

Workmen's Compensation Assurance.—The secretary spoke upon the Workmen's Compensation Assurance question, renewals of which will soon have to be considered, and said it would be necessary to decide whether the members of this Federation should deal with the matter as a body or as individual associations. Ultimately it was decided: "That a small committee, consisting of one representative from each local association, be appointed to go into the question, and that each local association consider the matter as quickly as possible, and appoint their representative, who, if unable to attend, should appoint a substitute."

It was decided to hold the next quarterly meeting of the Federation at Newcastle-on-Tyne.

AN AMALGAMATION.—Messrs. William A. Peters and Sons, builders and timber merchants, of Rochdale, have arranged to transfer their business to a company, to be amalgamated with the similar business hitherto carried on by Mr. T. Woolfenden, under the style of Ashworth and Woolfenden. Mr. William Peters continues with the new firm, Peters and Woolfenden, as joint manager with Mr. Woolfenden.

A BUILDING OF FIFTY-TWO STOREYS will result from the addition of four storeys, or 42 feet, to the white marble tower at the corner of the New York premises of the Metropolitan Life Insurance Co. The total height will then be 700 feet above the street pavement.

Current Market Rates of Materials in the Various Trades.

The quotations given in this list apply only to larger quantities purchased in London (the minimum quantity for which these prices are applicable being given where practicable). Retail purchasers must expect to pay a reasonable advance on wholesale rates, as well as carriage. The trade discounts for each item have not been considered, as these would be affected by the quantity of the goods purchased. The market rates one month ago for those materials which are subject to any appreciable fluctuations are also given, for purposes of comparison, and as indicating a rise or fall in prices.

BRICKLAYER.

The current rates for stocks, Flettons, and other common building bricks, and for local facings are not given, as local considerations obviously affect their prices, and readers who may make use of the information given in these columns can readily obtain quotations for themselves.

		Current rates.	Rates for similar materials on April 1.
Best blue pressed Staffordshire bricks	per 1,000	3 5 0	
do. bullnose bricks	do.	3 15 0	
Best Stourbridge fire bricks	do.	4 15 0	
Glazed Bricks.			
Best white and ivory white-glazed one side	per 1,000	10 7 6	10 10 0
do. glazed one end	do.	9 17 6	9 15 0
do. quoins, bullnose bricks, and bricks glazed on 4½in. side	do.	13 17 6	14 0 0
do. glazed two sides (double stretchers)	do.	15 17 6	15 0 0
do. glazed two ends (double headers)	do.	12 17 6	13 0 0
do. glazed one side and two ends	do.	16 17 6	15 0 0
do. glazed two sides and one end	do.	17 17 6	15 10 0
Splays, chamfers, and squints (to an angle of 45 degs.)	do.	15 7 6	15 10 0
Double bullnose bricks, double splays, round ends, bullnose stops, and mitres	each	0 0 5	0 0 4½
Double bullnosed mitres ...	do.	0 0 7	
Internal angles, 2¼in. radius	do.	0 0 4	0 0 4½
do. do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Best buff and cream	per 1,000	11 17 6	12 0 0
do. glazed one end	do.	11 7 6	11 0 0
Other colours, extra ...	do.	4 0 0	
do. quoins, bullnoses, and bricks, glazed on 4½in. sides*	do.	5 17 6	16 0 0
do. glazed two sides (double stretchers)*	do.	18 17 6	19 0 0
do. glazed two ends (double headers)*	do.	15 17 6	16 0 0
do. glazed one side and two ends	do.	19 17 6	19 0 0
*These bricks in other colours, extra	do.	3 10 0	3 0 0
do. glazed two sides and one end	do.	20 17 6	20 0 0
Splays, chamfers, and squints for an angle of 45 degs	do.	9 17 6	10 0 0
In other colours, extra ...	do.	3 0 0	
Internal angles, 2¼in. radius	each	0 0 5	0 0 6
do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Ordinary-quality salt-glazed bricks, glazed one side ...	per 1,000	8 17 6	9 0 0
do. glazed one end	do.	8 7 6	8 5 0
do. quoins, bullnoses and bricks, glazed on 4½in. sides	do.	12 7 6	12 10 0
do. glazed two sides (double stretchers)	do.	14 7 6	13 10 0
do. glazed two ends (double headers)	do.	11 7 6	11 10 0
do. glazed one side and two ends	do.	15 7 6	13 10 0
do. glazed two sides and one end	do.	16 7 6	14 0 0
do. splays, chamfers, and squints for an angle of 45 degs.	do.	13 17 6	14 0 0
Specially prepared or dipped salt-glazed with plain glazed side or ends, as described above, same price as for best ivory whites	per 1,000		
Ordinary-quality salt-glazed double bullnoses, double splays, round ends, bullnosed stops and mitres	each	0 0 4	
Best dipped salt-glazed do.	do.	0 0 5	0 0 4½
Ordinary salt-glazed double bullnosed mitres	do.	0 0 4	
Best dipped salt-glazed do.	do.	0 0 5	
Ordinary salt-glazed internal angles, 2¼in. radius	do.	0 0 3	0 0 4¼
do. 4½in. radius	do.	0 0 5	
Best dipped salt-glazed internal angles, 2¼in. radius	do.	0 0 4	0 0 4¼
do. 4½in. radius	do.	0 0 8	
Ordinary salt-glazed moulded bricks (stretchers and headers)	do.	0 0 8	0 0 4
Best dipped do.	do.	0 0 8	0 0 6

Second-quality glazed white and ivory white, 30s. per 1,000 less than best white			35s. less.
Second-quality coloured bricks, same price as best whites of their respective descriptions			
Plain arch bricks £6 per 1,000 above list for respective kinds and colours			£4 per 1,000 above list.
Cambered arch bricks 1s. 2d. each, any kind or colour, if not exceeding 9ins. by 4½ins. by 3½ins.			1s. each.
Rich majolica glazed bricks (headers and stretchers)	per 1,000	21 17 6	24 0 0
do. quoins and bullnoses ...	do.	26 17 6	27 0 0
Sand, Ballast, Cement, Lime, and Fireclay.			
Thames and pit sand ...	per yard	0 7 0	
Thames ballast	do.	0 5 6	
Best Portland cement ...	per cask	0 5 10	
Best ground blue lias lime	per ton	0 19 0	
(NOTE.—The charge for the sacks to be added to prices per ton.)			
Grey stone lime	per yard	0 11 6	
Stourbridge fireclay in sacks	per ton	0 27 6	upwards

MASON, SLATER AND TILER.

The average current prices for stone per foot cube are given in the following list, the railway rates being calculated on the assumption that orders will be given for full truck loads of about 4 tons upwards.

Brown Whitbed Portland stone (in blocks containing on an average 20 ft. cube)	per ft. cube	0 2 0	
White Basebed do.	do.	0 2 2	
Bath stone	do.	0 1 5	0 1 7
Beer stone	do.	0 1 7½	0 1 6
Ancaster stone	do.	0 1 10	
Greenshill stone	do.	0 1 10	
Chilmark stone	do.	0 1 9	
Darley Dale stone	do.	0 2 3	upwards
Red Mansfield stone	do.	0 2 4	
Closeburn red freestone ...	do.	0 2 0	
Hard York stone	do.	0 2 10	
do. 6 in. sawn both sides landings (random sizes)	per ft. super	0 2 4	
do. 6 ins. rubbed two sides do.	do.	0 2 7	
do. 3 ins. sawn two sides slabs	do.	0 1 0	
do. 2 ins. self-faced random slabs	do.	0 0 6	
Broken granite 1½ in. gauge	per yard	0 14 0	
do. do. 2 in. gauge	do.	0 14 6	
do. do. 2½ in. gauge	do.	0 13 7	
Norwegian granite kerb, 6ins. by 12 ins. and 12 ins. by 6 ins.	per ft.	0 1 7	
do. circular	do.	0 1 10	
do. 12 ins. by 8 ins.	do.	0 1 10	
do. circular	do.	0 2 1	
Aberdeen pitchings, 3 ins by 6 ins.	per yard super	0 14 6	
do. 3 ins. by 7 ins.	do.	0 15 9	
do. 4 ins. by 6 ins.	do.	0 13 3	
Slates.			
Best blue Bangor Countess slates	per 1,000 of 1,200	13 0 0	upwards
do. 20 ins. by 12 ins.	do.	13 15 0	
First-quality Bangor Countess slates	do.	12 17 6	
do. 20 ins. by 12 ins.	do.	13 10 0	
do. Ladies	do.	7 5 0	
Permanent green Countess slates	do.	11 10 0	upwards
do. 18 ins. by 10 ins. ...	do.	9 10 0	
do. Ladies	do.	6 10 0	
Best "Eureka" unfading green Countess slates ...	do.	15 15 0	
do. 20 ins. by 12 ins. ...	do.	18 7 6	
do. 18 ins. by 10 ins. ...	do.	13 5 0	
do. Ladies	do.	10 5 0	
Best blue Portmadoc Countess slates	do.	13 10 0	
do. Ladies	do.	6 10 0	
**These prices are for lots not less than 4 tons.*			
Tiles.			
Plain red roofing tiles ...	per 1,000	2 2 0	
do. hip and valley tiles ...	per doz.	0 3 6	
Best Broseley tiles	per 1,000	2 10 0	
do. ornamental tiles	do.	2 15 0	
do. hips and valley tiles ...	per doz.	0 3 10	
Edwards's (Ruabon) brindled red or brown tiles ...	per 1,000	2 17 0	
do. ornamental do.	do.	3 0 0	
Valley tiles	per doz.	0 3 9	
Hip tiles	per doz.	0 4 0	
Peake's mottled or red Staffordshire tiles	per 1,000	2 12 0	
do. ornamental do.	do.	2 15 0	
Valley tiles	per doz.	0 3 6	
Hip tiles	do.	0 4 0	
Best "Rosemary" plain tiles	per 1,000	2 5 0	
do. ornamental do.	do.	2 8 0	
Valley tiles	per doz.	0 3 7	
Hip tiles	do.	0 4 0	
"Hartshill" sand-faced tiles	per 1,000	2 10 0	
do. pressed do.	do.	2 5 0	
do. ornamental	do.	2 12 6	
Valley tiles	per doz.	0 3 5	
Hip tiles	do.	0 3 11	

CARPENTER AND JOINER.

Fir timber best middling Danzic or Memel.	per load	4 15 0
Seconds	do.	4 10 0
Small timbers (8 ins. to 10 ins.)	do.	3 15 0
do. (6 ins. to 8 ins.)	do.	3 10 0
Swedish Balks	do.	3 0 0
Pitch-pine (average 30 ft.)	do.	4 5 0
Deals best 3 ins. by 11 ins., 4 ins. by 11 ins., and 4 ins. by 9 ins.	per standard	14 10 0
For deals 3 ins. by 9 ins. deduct	do.	1 0 0
For deals seconds deduct...	do.	1 5 0
Battens, best, 2½ ins. by 7 ins., 2½ ins. by 8 ins., 3 ins. by 7 ins., and 3 ins. by 8 ins.	do.	12 0 0
For battens 2½ ins. by 6 ins. and 3 ins. by 6 ins. deduct		0 10 0
For battens seconds deduct from best	do.	0 15 0
Battens 2 ins. by 4 ins. and 2 ins. by 6 ins.	do.	9 10 0
do. 2 ins. by 4½ ins. and 2 ins. by 5 ins.	do.	9 0 0
For foreign sawn boards 1 in. by 7 ins. and 1¼ ins. by 7 ins. add to price of battens	do.	0 10 0
For ¾ in. do. add	do.	1 0 0
White Sea first yellow deals 3 ins. by 11 ins. (average price)	do.	24 0 0
For 3 ins. by 9 ins. deduct	do.	2 0 0
Second yellow deals 3 ins. by 11 ins.	do.	19 0 0
For 3 ins. by 9 ins. deduct	do.	1 0 0
Third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	13 10 0
White Sea first yellow battens 2½ ins. by 7 ins. and 3 ins. by 7 ins.	do.	17 0 0
Second do.	do.	13 10 0
Third do.	do.	11 10 0
Petersburg first yellow deals 3 ins. by 11 ins.	do.	21 10 0
For 3 ins. by 9 in. deduct from above	do.	3 0 0
do. second yellow deals 3 ins. by 11 ins.	do.	16 0 0
For 3 ins. by 9 ins. deduct	do.	1 0 0
do. third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	13 0 0
Petersburg battens, first...	do.	14 0 0
do., second	do.	11 10 0
do. third	do.	10 10 0
White Sea and Petersburg, first white deals, 3 ins by 11 ins.	do.	14 10 0
For 3 ins. by 9ins. deduct from above	do.	1 0 0
do., second white deals 3 ins. by 11 ins.	do.	13 10 0
For 3 ins. by 9 ins., deduct from above	do.	1 0 0
do., first white battens ...	do.	11 0 0
do., second do.	do.	10 0 0
Pitch-pine deals	do.	19 0 0
Add for less than 2 ins. thick	do.	0 10 0
First yellow pine regular sizes	do.	44 0 0
do., oddments	do.	32 0 0
Second yellow pine regular sizes	do.	33 0 0
do., oddments	do.	28 0 0
American whitewood planks	per ft. cube.	0 4 6
Kauri pine planks	do.	0 4 0
1 in. by. 7 ins. yellow flooring, planed and shot ...	per square	0 14 0
Add, if matched	do.	0 0 6
1¼ in. by 7 ins. yellow, planed and matched ...	do.	0 16 6
1 in. by 7 ins., white planed and shot	do.	0 12 6

		Current Rates.	
1 in. by 7 ins., white, planed and matched ...	per square	0 13 0	
1¼ in. by 7 ins., do.	do.	0 15 6	
¾ in. by 7 ins., yellow matched boarding, beaded or V-jointed	do.	0 11 6	
1 in. by 7 in., do.	do.	0 15 0	
¾ in. by 7 ins., white do. ...	do.	0 10 0	
1 in. by 7 ins. do.	do.	0 13 0	
For 6 ins. boards deduct from the above prices ...	do.	0 6 0	

Hardwoods.

Teak	per load	18 0 0	
Danzig and Stettin oak logs (large)	per ft. cubs	3 0	
do., small	do.	0 2 6	
Wainscot oak logs	do.	0 5 9	
Dry wainscot oak (in the 1 in.)	per ft. super	0 0 9	
¾ in. do., do.	do.	0 0 7	
Dry Honduras mahogany (Tabasco), in the 1 in. ...	do.	0 0 10	
do., selected Figury do. ...	do.	0 1 8	upwards.
do., American walnut do....	do.	0 0 10	

FOUNDER AND SMITH.

Cast-iron columns and stanchions, including patterns	per ton	7 10 0	
do., drain pipes, 3 ins. diameter, L.C.C. weights, in 9 ft. lengths, coated with solution	per yard	0 2 4	
do., do., 4 ins. diameter ...	do.	0 3 0	
do., do., 5 ins., do.	do	0 3 10	
do, do., 6 ins., do.	do.	0 4 6	
do., do., 9 ins., do.	do.	0 6 3	
Rolled steel joists, Belgian (ordinary section)	per ton	5 10 0	
do., English	do.	7 0 0	
Rolled steel fencing wire...	do.	7 0 0	
do., galvanised	do.	9 0 0	
Steel compound girders (ordinary section)	do.	9 5 0	
Angles, channels, etc., do.	do.	9 5 0	
Galvanised sheets, common brands	do.	13 10 0	
Wrought-iron gas tubes (current discount off standard lists)	p.c.	65 p.c.	67 %
do., water tubes	do.	62½ p.c.	
do., steam tubes	do.	57½ p.c	
do., galvanised gas tubes...	do.	52½ p.c.	55 %
do., do., water tubes ...	do.	50 p.c.	
do., do., steam tubes ...	do.	45 p.c.	
Expanded metal lathing, ⅜ in. mesh (short way) 24 gauge, in quantities of not less than 300 yds. ...	per yard	0 0 10	
do., 22 gauge	do.	0 1 3½	
do., 20 gauge	do.	0 1 5½	
do., ¼ in. mesh, 24 gauge...	do.	0 0 10½	
do., 22 gauge	do.	0 1 4½	
do., 20 gauge	do.	0 1 6½	

(For quantities of between 300 and 700 yds. deduct approximately 10 per cent. from above; for quantities of between 700 to 1,400 yds., deduct approximately 15 per cent.)

PLUMBER, COPPERSMITH, AND GLAZIER.

Sheet lead, 3 lbs.	per ton	17 10 0	18 2 6
do., above 3 lbs.	do.	17 0 0	17 12 6
Lead water pipe up to 2 in.	do.	17 10 0	18 2 6
Lead barrel pipe	do.	18 10 0	19 2 6
Lead pipe, tinned inside ...	do.	44 7 6	45 0 0
do., and washed outside ...	do.	46 17 6	47 10 0
do., soil pipe, up to 4½ ins.	do.	20 10 0	21 2 6
do., do., to 6 ins.	do.	21 10 0	22 2 6
do., do., above	do.	22 5 0	22 17 6
Lead sash weights	do.	20 0 0	20 12 6
Sheet zinc	do.	28 0 0	upwards
Copper sheets	do.	75 0 0	78 0 0
do., nails	per lb.	0 0 10	
do., wire	do.	0 0 10	
Plumber's solder	per ton	65 0 0	
Tinman's solder	do.	80 0 0	
Old lead (against account, etc.)	per cwt.	13 7 6	
Clean scrap brass, do. ...	do.	2 1 6	2 2 0
Clean scrap copper, do. ...	do.	2 13 0	2 14 0
Old zinc, do.	do.	0 16 6	0 16 0
15 oz. English sheet glass, thirds (in crates)	per foot	0 0 2¼	
do., do., fourths	do.	0 0 1¾	
21 oz. do., do., thirds ...	do.	0 0 3	
do., do., fourths	do.	0 0 2½	
26 oz., do., do., thirds ...	do.	0 0 3¼	
do., do., fourths	do.	0 0 3	
32 oz., do., do., thirds ...	do.	0 0 4	
do., do., fourths	do.	0 0 3½	
For obscured sheet glass add to fourths	do.	0 0 1	
15 oz. fluted sheet	do.	0 0 3¼	
21 oz., do., do.	do.	0 0 4	
For obscured fluted sheet, add to above	do.	0 0 1	
⅛ in. plain rolled plate ...	do.	0 0 2¼	
3-16 in., do., do.	do.	0 0 2½	
¼ in. do., do.	do.	0 0 3	
For rolled fluted plate add to the above prices ...	do.	0 0 7	

THE PARIS LABOUR TROUBLES.

The end of the Paris labour troubles is not yet. It is true that the lock-out no longer exists; but it is one thing to open the workshops, and another to get the workmen to return to them. The men profess to be very keen on a nine-hours day; but the employers, in the long string of rules which they require the workmen to sign before resuming, demand that the normal working hours shall be as follows: March to October, 10 hours a day; February and November, 9 hours; December and January, 8 hours. Even this "time-limit," however, is by no means absolute; for there is an express stipulation that the day's work may be prolonged by two hours without increase in the rate of payment per hour, a qualification that, in the absence of any kind of restrictive clause, seems, to the English mind, to be extraordinarily elastic, not to say evasive; since apparently it leaves the two hours' extension entirely at the option of the employer, who may insist on exercising his right every day in the week and all the year round. The degree of scorn that such terms would excite in the English trade-unionist is immeasurable, and it is difficult to suppose that his French congener is more tolerant and placable. Indeed, it is reported that the workmen's organisation is doing all in its power to induce the men who are at work to throw down their tools at the end of nine hours of labour; the object being to force the employers to accept defeat or to dismiss the workmen. The situation, therefore, is more strained than before. The police and municipal guards are already on the alert to repress expected disorder; and there are lively apprehensions as to what may happen on Labour Day.

EDISON'S CONCRETE HOUSES.

A Report by Two Experts.

The particulars furnished by New York correspondents of the newspapers in regard to Mr. T. A. Edison's scheme for erecting concrete houses for the working classes have already been given in these columns, and the matter has furnished substance for some comment, chiefly sceptical or jocular. But for the most part, the reports which have reached us through the newspapers have been too sketchy and untrustworthy to enable any definite opinion to be formed in regard to the scheme. In the "Cement Age," however, we find what is termed the first authoritative article on the subject. This has been written by Mr. Edward S. Larned, civil engineer of Boston, and chairman of the Committee on Tests of Cement and Concrete of the National Association of Cement Users, and Mr. Percy H. Wilson, A.M.A.S.E., secretary of the Association of American Portland Cement Manufacturers. These two gentlemen paid a visit to Mr. Edison's laboratory at West Orange, N.J., and there investigated the matter. The report they now furnish bears testimony to the feasibility of the idea, but it is punctuated with adverse criticism, their estimates differing in some essentials from Mr. Edison's. The type of building proposed to be formed measures 49 ft. by 21 ft. by 35 ft. high, the walls being 12 in. thick at the ground-floor level, reduced to 8 in. at the second floor, with a roof 6 in. thick, and floors and partitions 4 in. thick, the whole to be formed of concrete run in between the sides of the mould; this mould to be built up of cast-iron plates ½ in. to 1 in. thick, nickel-plated or faced with brass on the inside in those parts where fine detail is required. The floors would be reinforced with ½ in. rods held in place by wiring.

Mr. Edison proposed to use a mixture of 1 cement, 3 fine sand, and 5 stone or gravel passing through a ½ in. mesh sieve. Great doubt, however, arises as to whether a house can be cast with such material. The concrete needs to be sufficiently thin to flow through the horizontal sections—the floors—yet sufficiently stiff to prevent the aggregate dropping to the bottom. Mr. Edison proposes to add to the concrete a fine clay, an electrolyte, or possibly a hydrated silica, to reduce the mixture to a more or less gelatinous condition. The writers, however, think that though this might be effectual while the material was in motion, *i.e.* when flowing, it would not prevent segregation when the moulds were filled: and there are various other points raised in this connection.

The following estimate of cost is made by Mr. Larned and Mr. Wilson, on the assumption that 24 houses could be built from one set of moulds per annum:—

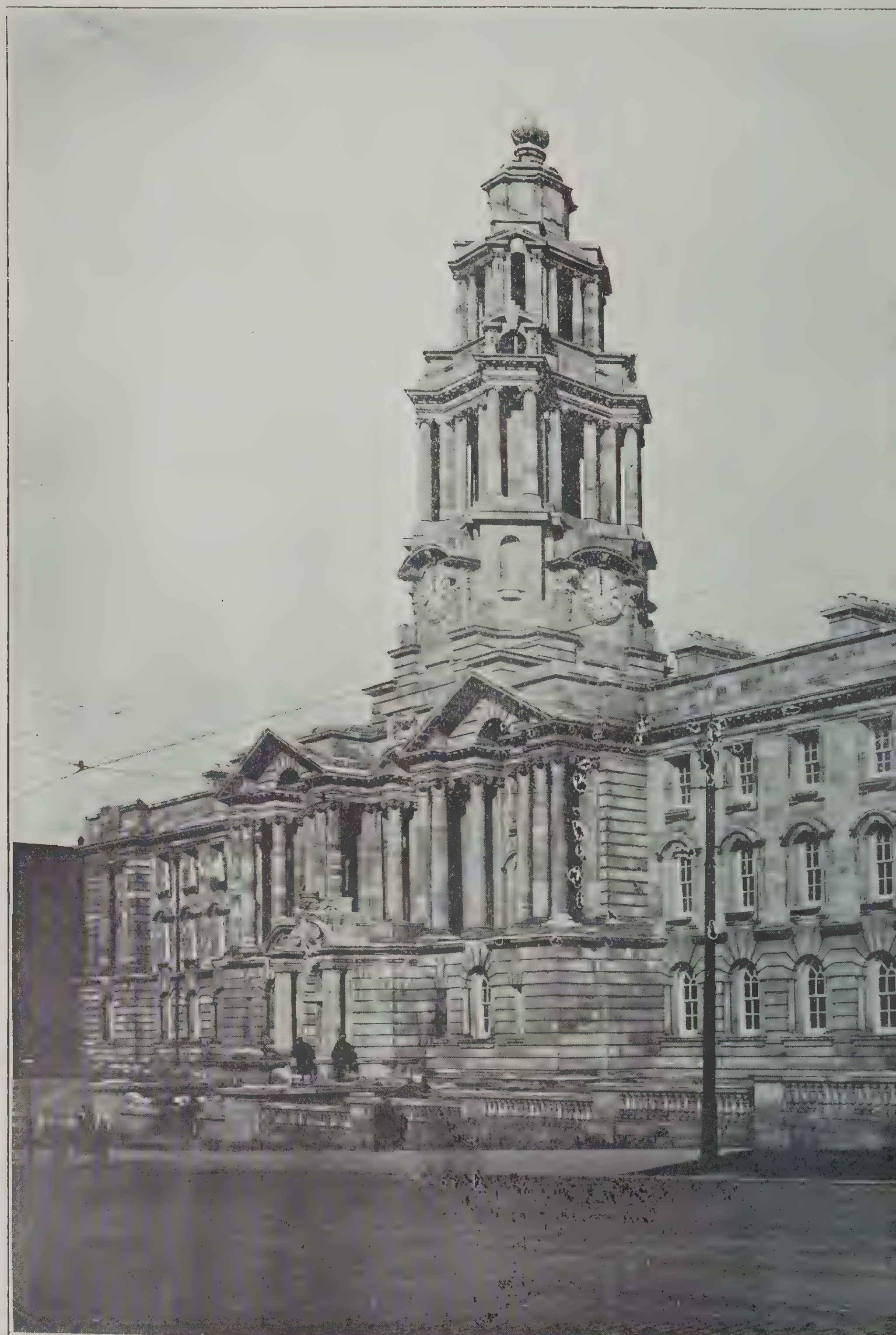
	$	£ approx
Cellar excavation: 250 cub. yds. at 30c.	75.00	15
Concrete: 200 cub. yds. 1, 3, 5, mixture		
Cement—206 barrels at 1.50 ...	309.00	62
Sand—94 cub. yds. at 0.65 ...	61.00	12
Stone—156 cub. yds. at 1.50 ...	234.00	47
Cost of mixing and placing same at 50c.	100.00	20
Steel reinforcement, 10,000 lbs. at 3c.	300.00	60
Moulds, erection and taking down, approximately 20,000 sq. ft., 225 tons at 2.00	450.00	90
Transportation of moulds and plant, including installation of latter	125 00	25
Plumbing and heating	175.00	35
Windows, doors, and wood trim, including paint	250.00	50
Fixtures	50.00	10
Total cost, labour and material	2,129.00	426
Moulds and plant, estimated cost 40,000 (Edison)		
Allow 20 per cent. interest and depreciation divided among 24 houses ...	333.00	67
Total cost	$2,462.00	493

N.B.—No allowance made for general expenses or contingencies.

It is stated that the moulds would weigh 450,000 lbs. (225 English tons) and these would require ten trucks of 22½ tons capacity, each making a train of 14 trucks, which, if transported at the fair average rate of 2 dollars (8s. 4d.) per ton, would amount to 600 dollars (£120). Concerning this, however, Mr. Edison says: "Suppose several hundred houses were erected at this spot, what becomes of the criticism on the cost of transportation?"

On the whole, as we say, the report is by no means entirely favourable, though recognising the possibilities of the scheme. Everything of course, depends on actual experiments which are now being undertaken. Meanwhile the sort of comment which has appeared in the newspapers about houses being poured out into moulds like so much jelly may be regarded as rubbish.

Official Enquiry into Water Supply.—A special official enquiry into the question of water supply, as distinct from the questions of sewage disposal and other sanitary matters, is advocated by the Association of Water Engineers, who are endeavouring to arrange for a deputation on the subject to the President of the Local Government Board.



NEW TOWN HALL STOCKPORT. SIR A.

Photo: E. Hulton & Co., Ltd.

MWELL THOMAS, F.R.I.B.A. ARCHITECT.

May 6, 1908.

Volume 28 No. 691.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

The Marble Arch Improvement. The scheme for the street improvement at the Marble Arch—originally formulated by Mr. F. W. Speaight upon a dignified, architectural, and properly balanced basis of design, and subsequently ruined by the absurd amendments insisted upon by the London County Council, is now nearing completion, and it is expected that within a few days the park carriage-way will be again available for vehicular traffic. In congratulating Mr. Speaight upon the successful conclusion of his efforts to bring about a most desirable public improvement, under which the hitherto congested state of the traffic at the Marble Arch will be relieved, we cannot refrain from expressing our great regret and disappointment that the architectural aspect of so fine a conception should have been allowed to be ignored by untrained and inartistic officials. We recently alluded to the good work done by Mr. John Burns with regard to the proposal to proceed with the erection of a public building comprising shops and municipal offices at Coventry. Does not the latest example of official incapacity, as evinced by the ruthless treatment of the original scheme for the Marble Arch improvement, offer Mr. Burns the opportunity of insisting that, for the future, official appointments, which carry with them the control of our public streets and buildings shall only be open to properly trained men whose artistic education has not been utterly neglected? Having regard to the nature and extent of the work necessitated by the alteration which has been made, there is no doubt that the improvement has been carried out by the Works Department of the London County Council with remarkable rapidity; indeed, it is said that during some stages of its progress as many as four hundred men, working in two gangs, one during the day and one during the night, have found employment. Those of our readers who are interested in such matters may like to know that the total cost of the improvement has been about £20,000—that 5,000 loads of earth and other material have been removed during the construction of the new roadway, which is paved with 380,000 wood blocks. The new footways have absorbed 12,000 sq. ft. of York stone paving, whilst upwards of 54,000 cub. ft. of concrete have been used in forming the foundations of the roadway, which has been raised in some parts to the extent of 4ft. A considerable amount of work has also had to be carried out beneath the roadway in order to rearrange and connect the various pipes forming the sewers, surface drains, and the public gas and electric light supplies. The gatekeeper's lodge, said to have been one of the two small pavilions designed by Decimus Burton, which formerly stood on either side of the archway, has been removed and re-erected on another portion of the site. Although the archway remains unaffected by the changes recently made in the surroundings, the structure has had its vicissitudes. Designed by Nash in 1825, it stood originally in the Mall opposite Buckingham Palace, of which it formed the main entrance—until the year 1851, when, consequent upon the enlargement of the Palace, it was removed to the site it now occupies to replace a brick gateway, designed by Sir John Soane, known as Tyburn Gate, which formerly occupied the north-east corner of Hyde Park. The archway, which is constructed of Carrara marble, is said to have cost about £80,000 (we do not, however, vouch for the accuracy of the figures), and it was the architect's intention to surmount the structure with a colossal bronze group emblematical of Victory. This idea, however, was subsequently abandoned, and it was decided to substitute an equestrian statue of George IV.; but this, although duly executed by Chantry, was never placed in the position for which it was designed, and may now be seen in Trafalgar Square. The sculptured reliefs of the archway are by Flaxman, Westmacott and Rosse. The ornamental gates, cast in copper alloy, suffered some damage during their transit from the foundry, and it is owing to this accident that they were shorn of their upper frieze and semicircle.

The President's "At Home" at the Institute. A very pleasant evening was spent by many of the members of the R.I.B.A. on the occasion of the "At Home" given by the President at 9, Conduit Street on April 28th, when there was exhibited a large and representative collection of working drawings and photographs, illustrative of the many important buildings designed by the late Mr. E. W. Mountford. Several of the drawings were of a more than ordinarily attractive nature, such, for instance, as the views of the interior of the new Central Criminal Court, by S. D. Adshead (we believe), while several of his geometrical drawings prepared for this and other buildings showed good draughtsmanship which was interesting to examine. Other examples of the architect's work included illustrations of the Northern Assurance Co.'s new offices in Lothbury, the Liverpool Technical School and Museum, town halls at Lancaster, Sheffield, and Battersea, the Northampton Institute, the Battersea Polytechnic and St. Olave's Grammar School, Southwark. Mr. Mountford's domestic work was represented by Minstead Grange—a house erected for his own occupation some years ago at Godalming—and his competitive work by the design he recently submitted for the new London County Hall.

The Picturesque in Architecture. In the excellent presidential address recently delivered by Mr. Dare Bryan before the Bristol Society of Architects) as reported in our issue for last week) many topics of perennial interest to the profession were discussed. We quite agree with Mr. Bryan in thinking that nothing short of the close study and free acceptance of the main features and principles of classic architecture (which he rightly regards as the outcome of the labours of generations of artists) will enable the architect of to-day to produce good work in the grand manner, and that it is "conceit on our part to think we can evolve a new scale of proportion or that the Ionic capital can be improved by turning it upside down." But, on the other hand, much as we should like to be able to do so, we are unable to accept, in its entirety, the comforting assurance that "on every side there are signs of scholarship and the careful study of those proportions which for two thousand years have been universally admired by the trained eye." A little reflection will make it clear that this is not altogether the case; on the contrary, we think it will be found that scholarship and tradition are still constantly ignored, whilst at the same time what Mr. Bryan describes as "the thraldom of the merely picturesque" is still apparent in the world of architecture. It is true we have not been able to make a close examination of the more important buildings now in course of erection in provincial cities and towns, but if, as we believe is the case, we may fairly take current work in

H. R. AND B. A. POULTER, ARCHITECTS. *(Royal Academy Exhibition, 1908.)*

London as a criterion, we must frankly confess that, in our opinion, the art of architecture is still in a moribund condition. We do not suggest that an hour or two spent in a careful inspection of the new buildings recently completed, or in course of completion, in the neighbourhood of, say, Oxford Street, would be very profitably employed, but let us nevertheless see what evidence they have to offer in support of Mr. Bryan's optimistic assertion. Eastward of the Circus stands a huge new building in which there are certainly "signs of scholarship," if this expression can be rightly used in connection with the adoption, in a portion of the design, of certain features culled from a well-known building of which the designer was both a scholar and an artist. Had the continuity of the style of the lower part been maintained throughout the façade, the building might have some claim to be regarded as one of more than average merit; but, unfortunately, as is usual in these days, style, tradition, dignity and proportion have had to be sacrificed to what the untrained architect is pleased to term "the picturesque," and the designer of this building has hopelessly failed—as anyone would fail—in a Titanic attempt to successfully blend two such ill-assorted styles as those known respectively as the Jacobean and the late 18th century Renaissance. Look at the front of the Farnese Palace, think of its simplicity, its harmony, its quiet, dignified repose; and then look again at the building we are discussing, with its unrest or, if the term is preferred, its "picturesqueness." In close proximity to this building is another new one, now nearing completion, in which, we are glad to say, no features of the "merely picturesque" type have been introduced by the architect, who has, however, made a great effort "to evolve a new scale of proportion" for the Order he has adopted. Again, in Regent Street and Piccadilly there is another immense structure, partly 18th century Renaissance, partly Jacobean, overfeatured, vicious in much of its detail, and generally incongruous and restless. Many other examples could be given of the deplorable condition into which modern architecture has been allowed to drift—consequent, in a large measure, upon the misapprehension and misapplication of the term "picturesque." Indeed, as an attribute of monumental architecture, picturesqueness ought only to be conspicuous by reason of its absence.

Housing London University. The housing of London University was last week the subject of questions by Sir William Collins and Sir Philip Magnus in the House of Commons. Sir William asked whether, in view of the inadequate provision for the University at the Imperial Institute, further space in that building could be allotted. Mr. Hobhouse replied that he could hold out no hope of extending the present accommodation. Sir Philip asked whether the whole of the Imperial Institute could not be given for the use of the University. Mr. Hobhouse could not give a definite reply. A University occupying apartments is surely a curious anomaly; and that the chief seat of learning of the capital of the Empire should be driven to such shifts is a strange commentary on the national—or at all events the civic—regard for education. Nothing short of a dignified, expressly designed, and in every way adequate building, should be acknowledged as a satisfactory solution of the difficulty. The Imperial Institute is doubtless a noble building, but it was not designed for the housing of London University. Perhaps, if ever Mr. Paul Waterhouse's scheme for the regeneration of the southern bank of the Thames is materialised, London's new University may present a worthy frontage to the river.

Labour Disputes at Home and Abroad. The Paris labour difficulty presents no new features of importance. The anticipated May Day disturbances did not occur, and it is reported that the masons are gradually filling the workshops, which are now not greatly undermanned. To a mere foreigner, the numerous manifestoes on each side are curiously diffuse and rhetorical, not to say unsubstantial and frothy, the practical points at issue being, it would seem, studiously ignored. For the study of home methods, we shall unfortunately have ample opportunity in watching developments in the shipbuilding dispute that came to a head on Saturday last, when the shipwrights, joiners, cabinetmakers, woodcutting machinists, and men engaged in the furnishing trades, at the federated shipyards on the Clyde at Barrow-in-Furness, Birkenhead, Hull, Sunderland, Leith, Aberdeen, and Dundee, were locked out in consequence of the failure to terminate the dispute on the North-East Coast, by which the men of those societies are affected. That dispute began in the middle of last January, when the men (prominent among them being the Joiners' Society) struck against a proposed reduction of wages. The men were willing to accept a reduction of 1s. a week, but the employers maintain that, owing to the depression in trade, a reduction of 1s. 6d. is necessary. It is hardly necessary to point out that although builders have no very direct interest in the dispute, the enforced idleness of some 12,000 men—many of them woodworkers, painters, etc., can hardly fail to affect the labour field with which we are more closely associated.

Flint Walling. The extreme durability of flint walls is emphasised by a correspondent of the "Field," who claims that dozens of instances could be named of Saxon and Norman buildings in which flint has been used as the chief or sole material in the building of walls that still stand sound and firm after the lapse of seven or eight hundred years. He admits the disadvantages of the material. It is very heavy, and therefore expensive to carry; and it does not bind well with mortar. Then, again, the small size of the stones, their irregularity of shape, and the extraordinarily large proportion of cementing material required, all render flint rather a dear and difficult building material to use, in spite of the low price at which it can be bought. Where, however, walls of more than 9 ins. in thickness are required, flint is of very great value as a filling material for cavity walls of brickwork, which it binds together into a solid mass. Many of the churches in Norfolk, Suffolk, Berkshire, Wiltshire, Hampshire, Sussex, and Kent built during the latter part of the nineteenth century are constructed in great part of flint; but the writer ventures to prophesy that many of them will have tumbled to pieces long before many of their Norman neighbours. Privett Church, in Hampshire, a quite modern example of flint architecture, is generally supposed to be the best flint building in the county; and perhaps the best instance of dressed-flint work in the south is to be found in the park walls at Arundel Castle, and in the walls of the church and churchyard at Streat, near

Lewes, in both which cases the stones are not only dressed flat, but are also squared. The writer believes that motor traffic has rendered flint obsolete for road-making.

The Lych-Gate. Some interesting notes on lych-stones and lych-gates are supplied by Mr. Harry Hems in the course of a newspaper letter, in which he protests with characteristic vigour against the proposal to remove the ancient granite "coffin-stone" which for centuries has stood within the lych-gate of the fifteenth century church of St. Martin, Liskeard. The earliest reference to a lych-gate in England, Mr. Hems observes, is probably one dated A.D. 1272, in which mention is made of the corpse of King Edward II. resting beneath the gate that then stood near to Gloucester Cathedral. In the Prayer Book for 1549 the priest is directed to meet the corpse at the church "stile"—that is, the lych-gate. In many parts of the country, Mr. Hems explains, it was customary to carry the coffin underhanded by means of white bands of cloth, passed through the handles and under it. Upon arrival at the lych-gate, the coffin was rested upon the lych-stone. Very few of these stones are now in existence and "in situ." They are usually about 6 ft. long; on plan either oblong, with sides of equal width, or formed rather narrower at one end than at the other. It is claimed for them by some credited authorities that they are even older than are the ancient lych-gates themselves; that, indeed, they date from the times of the Druids.

A CONTRACT FOR CAPE TOWN CATHEDRAL that has just been signed provides for carrying on the structure so far as to include the intersection of the nave and future transepts, also one bay of the south transept, and one complete bay of the nave carried up to the finished roof with triforium and clerestory. The amount of this contract is £25,000. In the new buildings there will be seating for about 1,000 persons, exclusive of the choir.

ARCHITECTURE AT THE ACADEMY.

The observation that "Punch is not so good as it was," and the reply—"It never was," serves as an apt illustration of the attitude of the average critic towards the annual exhibition of the Royal Academy at Burlington House; and this is not surprising when one considers that the novelty of the thing has long since worn off. At the same time, remembering that fact, it is all the more necessary to be as fair as possible in one's estimate of the works exhibited. The architectural critic at least can find some solace in the reflection that he has only one room to deal with, instead of an impracticable host. The comparatively few exhibits in the Architectural Room, however, are quite enough if one makes any careful study of each. And this year it cannot be said that such a study is particularly exhilarating, for there is very little of real interest to be seen in the room. The London County Hall competition has, as was expected, drawn in a more than ample quota of designs, competitors having taken this advantage to show the perspectives which were debarred in the competition. Among these is one of Messrs. Russell and Cooper's fine design, which, with its great central feature, masses up well, albeit the colour palette would be more appropriate in the sunshine of Italy than in the mist and fog of Westminster. In this latter respect the quaint perspective shown by Mr. Oldrid Scott is truer, if not so inspiring as a piece of architectural design appropriate to the County Hall, while Mr. Frank Atkinson's exhibits of his elaborate design strike still another note, and, as specimens of draughtsmanship, are quite excellent. Mr. Flockhart, Mr. Rickards, and Professor Reilly also show perspectives of their designs.

Among other exhibits of work of a public character we examined with most interest the design by Messrs. Adams and Holden for the new British Medical building now being erected in the Strand, Mr. Belcher's West End building, Mr. Leonard Stokes' design for new lecture rooms at Emmanuel College, Cambridge—scholarly in its simplicity and proportion, and the building for the London and Lancashire Fire Insurance Co. which has been erected in Pall Mall from Mr. Dawber's designs.

Mr. Reginald Blomfield shows a model of the St. Paul's Cross Memorial, and this is perhaps the most interesting exhibit in the room, while Sir Aston Webb's model of the angle of the new Admiralty building now being erected at the end of the Mall is also very interesting. The design for new Law Courts at Hong Kong, exhibited by Sir Aston Webb and Mr. Ingress Bell, however, is not in our opinion, a happy design in any way, whereas that for new offices in Cockspur Street for the Grank Trunk Railway of Canada is most effective and pleasing.

Mr. James Ransome shows a design for Government offices at Simla—a dull conception rendered in a prosaic manner, Messrs. Ashley and Winton Newman exhibit a crisp drawing of the centre portion of their Birmingham Council House extension, while numerous libraries, schools, and other similar buildings of varying interest are also shown; they call for no special comment, being best seen, admired—or forgotten.

Among the domestic work there is not anything like so good a collection as we have seen in former years, though we must except some work by Mr. Geoffry Lucas, Mr. Mallows, and Mr. Troup—the last-named showing a design for a house at Shotesham, Norwich, which deserves better than being skied. In regard to the domestic work, however, and especially with respect to the church work also, it is very difficult to form a true estimate, as in some cases the buildings would undoubtedly look far better in execution than they do as represented, while in other cases it seems fairly clear that to the draughtsmanship is really due whatever interest the design may have; and this is only another example of the folly and unreasonableness of excluding photographs from the Architectural Room, for it is, of course, the finished work, not the drawings of it, that tell.

Altogether, as we have indicated, there is very little to enthuse about in this year's exhibition.

OUTPATIENTS' AND CASUALTY DEPARTMENT, KING'S COLLEGE HOSPITAL, CAMBERWELL, LONDON, S.E.
WILLIAM A. PITE, F.R.I.B.A., ARCHITECT. (*Royal Academy Exhibition, 1908.*)

R.I.B.A.

Annual Report of the Council.

A meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., the chair being occupied by the president, Mr. T. E. Collcutt.

The report of the council for the year 1907-8 was presented. This made reference to numerous matters which have already been recorded in our columns, and are familiar to our readers, but the following summary of additional information or fresh matter may be given:—

Membership.

The present membership of the Institute is 2,239 (906 Fellows, 1,288 Associates, 45 Hon. Associates), as compared with 2,162 in 1907 and 1,972 in 1906, thus showing a progressive increase. The number of Probationers is at present 2,840, and of Students 864. (The council again have to regret that so large a number of students remain on the list without proceeding to the Final examination.)

Form of Agreement with Local Authorities.

The council are in communication with the President of the Local Government Board with reference to the proposed issue by the Board of a Form of Agreement to be entered into between local authorities and architects whom they employ.

Charter Revision.

The draft Charter and By-laws, as revised by the Charter Revision Committee and adopted at the business meeting held on December 2nd, 1907, is now in the hands of the Institute's solicitors, who are preparing the matter for submission to the Privy Council.

Competitions.

The following have been the president's appointments to assessorships during the official year:—

Bethnal Green, Town Hall, Mr. Henry T. Hare.
Cardiff, Boys' School, Mr. Leonard Stokes.
Ealing, Hospital, Mr. Edwin T. Hall.
Maidenhead, School, Mr. R. Selden Wornum.
Northampton, Library, Mr. Leonard Stokes.
Old Hill. Libraries, Mr. Henry T. Hare.
Pontypridd, Y.M.C.A. Building, Mr. R. Selden Wornum.
Stockport, High School for Girls, Mr. John W. Simpson.
Sunderland, Extension to Technical College, etc., Mr. A. W. S. Cross.
Tiverton, School, Mr. C. Harrison Townsend.
Wednesbury, Library, Mr. E. Guy Dawber.

Copies of the "Regulations" were sent to the promoters of 33 competitions, and in those cases where the conditions were unsatisfactory, letters were sent urging modifications.

The Competitions Committee vetoed the Weymouth Pier Pavilion competition, the Acton Council Offices competition, and the Pontypridd Union Offices competition.

Finance.

The Institute enjoys continued financial prosperity, the balance of income over expenditure being £2,085. The sum of £4,000 has been invested, as against £3,000 last year. The invested capital is now £25,796.

Development of Towns and Suburbs Committee.

At the beginning of the session a committee was appointed with reference to the Local Government Board's Housing and Town Planning Bill, then in course of preparation; and also with reference to the general question of town planning. On December 3rd a deputation from the committee waited upon the President of the Local Government Board and urged that some provision should be made in the forthcoming Bill for the formation of advisory committees composed of experts to be consulted in all matters connected with the preparation of town plans and plans for town extension. Subsequently, with a view to furthering the same object, the committee addressed a letter to the President of the Local Government Board. The committee have also approached the London County Council with regard to the constitution of an advisory committee of architects, and have under consideration the general question of the formation of such committees in connection with municipal authorities.

Miscellaneous.

During the past year the Cape Institute of Architects has been admitted to alliance with the R.I.B.A.

The portrait of Mr. John Belcher, A.R.A., painted by Mr. Frank Dicksee, R.A., is now exhibited at the Academy.

The balance of the Congress funds has been sufficient to defray the heavy cost of printing and issuing the *Comptes-rendus* of the Seventh International Congress of Architects held in London in 1906.

Waterloo Bridge and the Tramway Subway.

The Art Standing Committee, among other matters in their report, make reference to the alteration of the north-west abutment of Waterloo Bridge, carried out by the London County Council in connection with the subway connection between the northern and Embankment tramway systems. The stairs have had to be removed and a single arch, of much wider span, has been constructed over the double line of rails. The Art Standing Committee, when the matter was first undertaken, suggested that a better treatment would be to retain the existing staircase arch for the down line and to couple it with a second arch for the up traffic. This suggestion was approved by the Tramways Committee, and complete working drawings for the work were prepared. The Duchy of Lancaster, however, whose sanction was necessary, refused approval of the proposed alteration, and the summer vacation being then at hand, and the County Council being compelled to proceed with the work under heavy penalties, the Committee were reluctantly compelled to relinquish their efforts.

The Institute Form of Contract.

The Practice Standing Committee report that the revision of the Institute Form of Contract, arising out of the case of *Robins* v. *Goddard*, which was under discussion at the date of the last annual report, was brought to a conclusion by the presentation of the final report of the committee, which is now before the council. The committee have also had before them the question of a Form of Contract for letting building work in separate trades, as is customary in country districts. The matter, however, is postponed pending the more urgently required amendment of the Institute Form of Building Contract.

Other matters which have been referred to the committee, and upon which they have reported to the council, are—(1) The desirability of inserting some provision in the Institute Form of Contract for the bankruptcy of the contractor; (2) The possible liability of a building owner under the Workmen's Compensation Act; (3) The L.C.C. General Powers Bill, 1908; (4) The question of professional advertising. The last-named is still under consideration by the committee.

Identifying Marks for Portland Cement.

The Science Standing Committee have devoted a considerable time to a consideration of the means by which consignments of Portland cement could be readily identified as being actually of the kind specified, and it was suggested that this end would be attained by the adoption of a system of delivery in sacks or barrels bearing identifying seals; and, further, that it would be convenient if cement were always delivered in sacks of a uniform weight. (The usual practice of good manufacturers at present is to deliver eleven sacks to the ton.) This matter is still under consideration.

Cleaning of Stone Buildings: Paint Materials: Tests on Mortar.

The council having asked the Science Standing Committee to report on the methods at present in use for cleaning stone buildings, numerous inquiries have been made, the replies considered, and the result reported to the council. The committee have also under consideration the preparation of a standard of quality for materials used in the preparation of paints. They are also carrying out an interesting series of experiments on the qualities and properties of the various materials used in making mortar, the whole of the laboratory work in connection with which work is being done by Mr. W. J. Dibdin.

Board of Architectural Education.

During the past year the visitors appointed by the Board of Architectural Education have visited the Architectural Association Day Schools; King's College, London; the University of London, University College; Liverpool University; and Manchester University. The visitors have reported satisfactory progress in these schools. On the certificate of the Board, the council of the Institute now grant exemptions from the intermediate examination to students who have satisfactorily passed through approved courses at one of the recognised schools. The School of the Royal Academy has been included in the list of recognised continuation schools. The Board have under consideration the question of issuing standard examples of architectural features. Negotiations are proceeding as to the publication of certain sheets submitted to the Board by Mr. Mervyn Macartney, and an editorial committee has the matter in hand.

Alterations in the Intermediate and Final Examinations.

Several meetings have been held by a joint committee of members of the Board of Architectural Education and the Board of Examiners R.I.B.A. with a view to a modification of the programmes of the Intermediate and Final examinations, and certain alterations, approved by the Institute council, have been made which, it is hoped, will simplify the examinations and bring them into line with the syllabus of training drawn up by the Board.

In the programme of the Intermediate examination, instead of papers on (1) Classic Ornament, (2) Mouldings and Ornament, (3) The Orders, (4) History of Architecture, the following will for the future be set:—Two papers on the general history of architecture, and the purpose of architectural features in relation to the buildings in which these features occur.

In the Final examination the papers now set on mouldings, features, and ornament

will be remodelled, and the candidate will be required to show his knowledge of the principles of architecture, their theory and application, and to illustrate his meaning by drawings, and also by a written thesis on the subject.

A list of books recommended to students is now under the consideration of a joint committee of the two Boards, and will appear in the "Kalendar" for 1908-09.

A discussion followed, in which Mr. William Woodward, Mr. Edwin T. Hall, Mr. W. H. Atkin Berry, Mr. J. W. Simpson, Mr. Max Clarke, and Mr. George Hubbard took part.

THE CHANCEL OF ST. MARTIN'S CHURCH, WONERSH.

The chancel of the Church of St. Martin at Wonersh, Surrey, which we illustrate on this page, is lined with bands of light and dark alabaster, the large upright slabs, 7 ft. long, being cut and opened to match the figure. The chancel arch, with soffit 4 ft. 6 ins. deep, together with the face, is also lined with alabaster in light and dark bands. This work was executed by Messrs. John Daymond and Son, of London.

Law Case.

Architect's Responsibility for Prevention of Dry Rot.—At Manchester Assizes the case of the *David Lewis Trust and Levy* v. *Graham* was settled. Damages were claimed from Mr. Alexander Graham, architect, of London, for what was alleged to be a breach of obligation as architect of the Sandlebridge Colony for Epileptics. Counsel for plaintiffs stated that two years after the completion of the buildings, it was discovered that the ground floors were attacked by dry rot to such an extent that they had to be reconstructed. None of the timber in the upper floors was affected. Only one floor, that of the recreation hall, escaped the mischief, and that floor, it was alleged, was the only one that had been properly and adequately ventilated. All the others were provided with gratings in the side walls, but no provision was made for ensuring currents of air. In December, 1904, when the final payments were made, the buildings looked perfect, and so pleased was Mr. Levy with them that he wrote special letters of thanks to the architect, the builders, and the clerk of the works. In 1906, however, dry rot was found to exist extensively in the woodwork of all the floors, in consequence of the lack of proper ventilation underneath them. The gratings were rendered ineffective by the concreted floors of passages, which formed effective barriers to the passage of air, no apertures having been left in them for the passage of cross currents. The spaces under the floors were so many sealed chambers with stagnant air and considerable moisture, which presented the conditions most favourable for the development of dry rot. The conditions were accentuated by the presence of linoleum on the floors—it prevented air rising from beneath through the tongued and grooved floor-boards. A sum of £25 was spent in rectifying the mischief, and this, counsel submitted, must be taken as the measure of damages. The space beneath the floors has been filled with solid concrete. After the luncheon interval, when the Court resumed, defendant's counsel said he was pleased to say that his Lordship and the jury would not be further troubled with the case. Counsel felt that he had taken a serious responsibility in

CHANCEL AND ALTAR IN THE CHURCH OF ST. MARTIN AT WONERSH, SURREY. C. HARRISON TOWNSEND, F.R.I.B.A., ARCHITECT.

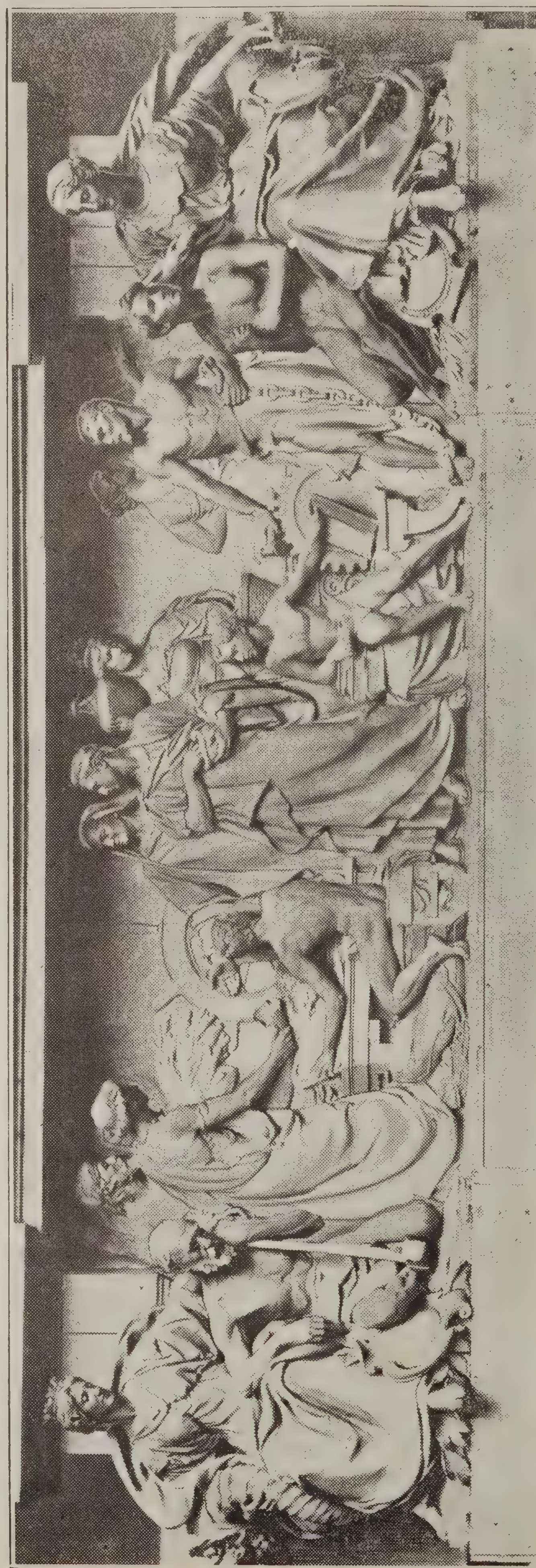
settling such a case, but he had been influenced by the feeling that, living in London, Mr. Graham had not, or the jury might think he had not, visited Sandlebridge as frequently as he might have done, and that he had trusted too much to people on the spot. Counsel claimed, however, that as regarded the design of the buildings—that was to say, the architectural part of the work—and the standing of Mr. Graham in his profession, which was of the very highest, not one word could be said against him. He agreed in these circumstances to pay a certain sum in full settlement as between plaintiffs and defendant. Counsel for plaintiffs said that his clients agreed that the record should be withdrawn on payment by the defendant of a lump sum. He might say, altogether apart from that arrangement and in no way as part of its terms, that with the exception of the matter of ventilation in the buildings erected at Sandlebridge, Mr. Levy frankly admitted that Mr. Graham had displayed great taste, judgment, and skill. He (Mr. Langdon) was given to understand that as far as ventilation was concerned there were circumstances which prevented the attention being given which Mr. Graham now realised ought to have been given to it. That was an error for which he (Mr. Graham) was now making reparation. Counsel wished on behalf of Mr. Levy to say that Mr. Graham's standing as an architect was of the highest. The Judge said the settlement was very satisfactory, and he was sure that defendant's advice to his client was most judicious.

MODERN SCULPTURE IN WHITEHALL.

Through the courtesy of the "Daily Graphic" we are able to illustrate on this page the plaster model of the group of statuary which is now being executed by Mr. Paul R. Montford and Mr. Frith on the arch that unites the new offices of the Local Government Board with the Home Office block at the lower end of Whitehall. Mr. Montford's figures embody and idealise the functions of the Local Government Board. On the extreme left is a female figure having at her right hand a cornucopia, typifying the wealth of the nation, upon which she may draw for the succour of the aged man whom she is supporting with her left hand. Balancing this group on the right is a female figure combining the attributes of Justice, Regal Authority and Britannia, which, extending a protecting hand to a young worker, typifies the Home Office. In the centre are nine figures symbolising the work of the Board of Trade, Commerce and Industries, Foreign Trade, Technical Education, and Woman's Work.

The work is remarkable for the felicity with which classical tradition is blended with something that approximates to modern realism. Although the figures by no means lack dignity, they do not betray the stiff and stony listlessness and lifelessness that are only too warrantably associated with English statuary of the last century. Mr. Montford may certainly be congratulated on having achieved one of the most notable pieces of modern sculpture in London—a further example of the ability which he displayed, with his co-sculptors, on the new City Hall at Cardiff.

Mr. Frith has embellished the spandrels of the archway, of which the architect is Sir Henry Tanner.



THE GROUP OF STATUARY ON THE NEW ARCH CONNECTING THE OLD AND NEW GOVERNMENT OFFICES, WHITEHALL, LONDON. PAUL R. MONTFORD, SCULPTOR.

ARCHITECTURAL HERALDRY.

This subject was dealt with by Mr. G. W. Eve in a paper which he read before the Architectural Association on Friday evening last.

Mr. Eve said the history of heraldry in architecture was, in fact, the history of heraldry itself, for no sooner had it come into being than it was employed in the sculptured decorations of the tombs and chantries which commemorated its early bearers, and thence it extended to the mural decorations, external and internal, of secular as well as ecclesiastical buildings.

Unmistakable legibility was the governing principle that, more than any other, had influenced heraldic design; as exemplified in the strong characterisations of animals, the adjustment to their spaces and the proportionate relation to their fields—qualities which were all dictated by the paramount consideration for clear definition of the statement of heraldic fact. The effect of these practical considerations on heraldic design was nowhere better shown than in the work of the 14th century, of which Mr. Eve said the finest example he knew was the shield, carved in alabaster, of the arms of Prince John of Eltham in Westminster Abbey. The fair distribution here exhibited characterised pre-Renaissance heraldry to a large extent, though there was a tendency in the early 15th century to a decrease of spirit in the animals, for which mere space filling was a poor substitute, the figures being packed tightly into their spaces without life or intention. The heraldry was sharing in the decadence of the Gothic, soon to be superseded by the revivified work of the Renaissance.

The Heraldry of the Renaissance.

This was very different in its attempt to give more recognition to natural form, in place of that which had become stereotyped; nevertheless, in its best examples, it expressed in its own way the same sense of vigour, and in proportion as it did so was satisfactory as heraldry, whereas the contemporary work that ignored the spirit and thought only of natural form resulted in a feeble kind of design that expressed neither one quality nor the other; it was this style of heraldry that influenced so disastrously our own work after the Gothic influence that had remained in the Tudor work had died out in the 16th century.

Tudor and Elizabethan Heraldry.

Tudor heraldry, including for convenience the English heraldry of the later part of the 15th century, was, at its best, excellent indeed, and affords a mine of suggestions of a kind that is not too far removed from modern feeling. Like the contemporary German work that was so strong and splendid, it included a free treatment of the Gothic forms and poses, and occupied its spaces in a reasonable way.

Elizabethan heraldry attempted a further reference to Nature, but in its effort to express animal movement often ignored the demands of the containing space, so that a lion, though it sometimes expressed a considerable amount of life and spirit, seemed to be rushing towards and out of the shield. It altogether missed that expression of intense vitality combined with decorative treatment which is so admirable in the mediæval work. Thenceforth the decadence of heraldry was rapid and complete. Just as architecture afforded splendid scope for the early heraldry, so it marked the end of the deadly period that began with the 17th century. The return to sound principles in heraldic decoration was begun when Williment worked on St. George's Chapel, Windsor Castle, where there was no lack of fine heraldry to inspire him in the splendid series of enamelled stall plates in the choir and the admirable sculptured devices on the walls. Williment also worked at Hampton Court among surroundings that included much fine heraldry in stone.

Pugin

found inspiration in the glorious work of all periods to be found in Westminster Abbey, and his work on the decorations of the Houses of Parliament (in which he was so ably assisted by his son-in-law John Powell) is the admirable result. Since that time there have been continuous efforts to improve the treatment of heraldry in architecture, with more or less success, but not sufficient advantage has been taken of the decorative and personal note which heraldry can give, both in private houses and in public buildings and monuments, though, as regards the latter, we have a recent example of its possibilities in the plinth of the Gladstone statue in the Strand, where the life of the statesman is set forth by the arms of (1) the Duchy of Lancaster—in which he was born, (2) of Scotland—the country of his origin, (3) of Oxford —where he was educated, and (4) of Newark—which gave him his first seat in Parliament.

Sir A. Brumwell Thomas proposed a vote of thanks to Mr. Eve for his paper, which was seconded by Mr. Andrew Oliver and supported by Professor Beresford Pite.

Officers and Council for 1908-09.

The following elections took place:—

President:
Mr. Walter Cave.
Vice-Presidents:
Mr. Henry Tanner, junr.
Sir A. Brumwell Thomas.
Council:

Mr. Louis Ambler.	Mr. Arthur Keen.
Mr. F. D. Clapham.	Mr. F. Winton Newman.
Mr. W. T. Curtis Green.	Mr. G. Gilbert Scott.
Mr. Baxter Greig.	Mr. A. Needham Wilson.

Mr. E. W. M. Wonnacott.
Hon. Treasurer:
Mr. Henry T. Hare.
Editor of "The Architectural Association Journal":
Mr. Edwin Gunn.
Hon. Librarian:
Mr. Percy May.
Hon. Secretaries:
Mr. C. Wontner Smith and Mr. Maurice E. Webb.
Hon. Solicitor:
Mr. W. H. Jamieson.
Hon. Assistant Librarians:
Mr. T. W. Watkins and Mr. A. J. Perrin.

Mr. S. A. Cowper, Mr. Hoult Horton and Mr. William Wallace were elected members of the Association.

Correspondence.

Competition in the Building Trade.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—We have read with great interest Mr. Jas. Townsley's able paper on "The Evils of Trade Competition," in your issue for April 29th, and would suggest, as a remedy for one of those evils, that architects make a rule to accept only the lowest tender but one in all competitions, instead of the lowest. This, in our opinion, would do much towards solving the problem, for it would be useless to cut to the uttermost, as such a course would only tend to placing one's tender at the bottom of the list, and thus cause one to lose the work, while at the same time the client would be well safeguarded, and better prices would result.

Yours truly,

London. E. K. and S.

Notes and News.

ERRATUM.—We regret that when publishing in our issue for last week the interesting paper on "The Evils of Trade Competition," the name of the author, Mr. Jas. Townsley, was incorrectly given as Mr. Jas. Townley.

* * *

MESSRS. HOMAN AND RODGERS, of Manchester, have supplied and fixed the constructional steelwork and are laying the reinforced concrete floors and wood blocks for the new schools at Clarence Road, Derby.

* * *

"THE TOWER OF GLOUCESTER CATHEDRAL" was the subject of a paper read by Mr. F. W. Waller before last week's meeting of the Gloucestershire Architectural Association. Repairs to the tower are now being carried out under Mr. Waller's direction.

* * *

MR. EDMOND COIGNET has a stall at the Municipal, Building, and Public Health Exhibition at the Agricultural Hall, where he is showing some good models illustrating the "Coignet System" of armoured concrete, also a number of photographs of works which have been carried out, or are in course of erection.

* * *

PRESENTATION TO A SURVEYOR. — At the Birkbeck College, former students of Mr. Henry Bushell, F.S.I., have presented him with an illuminated address and an autograph album on the occasion of his retirement as lecturer in surveying at the college, a post he had held for 20 years. The presentation was made by the principal, Dr. Armitage-Smith.

* * *

MR. WILLIAM H. WATTS, of 41, Brecknock Road, Camden Road, N.W., who is a specialist in architectural photography, and deals in scientific, mathematical, surveying, and drawing instruments, has taken over the control of our "Supply Department," and any communications relating to that department should in future be sent to his address.

* * *

MESSRS. NORTON AND GREGORY, LTD., of Castle Lane, Buckingham Gate, London, S.W., have taken over the business hitherto conducted by The Central Drawing Office Co., Ltd., at 30, Buchanan Street, Glasgow, which will be continued as their branch office at that address under the name of 'Norton and Gregory's Central Drawing Office, Glasgow, Ltd." This is the third concern they have absorbed during the past two years, which is eloquent testimony to their business enterprise.

* * *

SUMMER AND WINTER PALACE FOR BRIGHTON.—The Brighton Town Council definitely decided last Thursday in favour of a scheme for the establishment of a summer and winter palace on the foreshore. The decision was arrived at with one dissentient. The site is on the western side of the West Pier, extending towards the boundary of the borough in that direction. Originally the promoters desired a site of about a quarter of a mile long, but after negotiation a site 760 ft. in length was agreed upon. At last Thursday's meeting, however, there was a feeling in favour of a larger area being appropriated for the purpose, and this point was left open for the present, but

760 ft. is to be the minimum length. The question of the depth of the site is also to be further considered with a view to the remainder of the foreshore being properly protected.

* * *

ABERDEEN'S WATER SUPPLY SERVICE is to be extended at an estimated cost of £4,850.

* * *

CHURCH BUILDINGS AT BLACKHEATH.—Mr. Philip A. Robson, A.R.I.B.A., has been appointed assessor in a limited competition for church buildings at Blackheath.

* * *

ILKLEY'S NEW TOWN HALL, which was formally opened on April 27, has been built from designs by Mr. W. Bakewell, of Leeds, at a cost estimated at about £20,000. The buildings include a free library and an assembly hall that will hold about 1,000 people.

* * *

THE COMPLETION STONE of the tower of the new municipal buildings at South Shields was fixed last week by the mayor (Councillor Wylie), who was hauled up in a skip, the tower being 140 ft. high. The architect is Mr. E. E. Fetch, of London, and the contractors are Messrs. Neill and Sons, of Manchester and Newcastle.

* * *

ADDITIONS TO THE LANGHAM HOTEL.—In a paragraph on page 20 of our issue for last week the contractors for the extensive new additions now being made to the Langham Hotel are stated to be Messrs. Walter Lawrence and Son, of Waltham Cross. This is not so. The contractors are Messrs. E. Lawrance and Sons, of 14-16, Wharf Road, City Road, London, N.

* * *

MESSRS. BURN BROS., of 3, Blackfriars Road, and 6a, Stamford Street, S.E., have an attractive exhibit at Stand 140a at the Municipal, Building, and Public Health Exhibition now open at the Agricultural Hall. They show very complete apparatus for the bacterial treatment of sewage, including syphons, a rotary sprinkler, and the "Whirl Spray" sewage jet in working order, the last-named covering equally an area of 8ft. diameter. The firm's "Certus" automatic flushing tanks and sewer-flushing syphons are also shown, as well as a selection of sluice valves, penstocks, drain-testing appliances, etc.

* * *

NEW MUNICIPAL WORKS.—The Local Government Board has decided to hold inquiries into proposed expenditure by public bodies as follows: *Sewerage, Drainage, Sewage Disposal Works and Plant.*—Woking Urban District Council, £17,000 (May 7); Reading Borough Council, £4,050 (May 6). *Water Supply Work and Plant.*—Chapel-en-le-Frith, £3,000 (May 6); Skegness Urban District Council, £900 (May 8). *Street Improvements, Roads, etc.*—Aberavon Borough Council, £313 (May 7); Scunthorpe Urban District Council, £3,000 (May 7); Wimbledon Borough Council, £2,000 (May 6); Plymouth Borough Council, £980 (May 6). *Electricity Supply Works, and Plant.*—Stockport Borough Council, £10,500 (May 7). *Various.* — Scunthorpe Urban District Council, land for fire station (May 7); Ammanford Urban District Council, for lighting, £1,000, and for purchase of premises, £1,400 (May 6).

Notes on Competitions.

Welsh National War Memorial.

The competitive models for the Welsh National War Memorial having been on view at the Cardiff Law Courts, some interesting comments on them were obtained by a representative of the "Western Mail," from an unnamed "artist of wide repute," whose opinions are here shortly summarised. The winning model, by Mr. Albert Toft, shows more refinement than any of the others. If the pedestal, which is an excellent piece of Renaissance treatment, was designed by the sculptor himself, it reflects credit on his architectural knowledge and taste. The figures, symbolical of Mourning and Courage, are graceful in design and modelling, while the winged figure at the summit is correctly made to stand firmly on both feet, because a piece of sculpture should always appear to be as substantially fixed as it really is. In its beautiful proportions and general effect, Mr. Toft's model outclasses the rest. It was no doubt fully realised by the assessors (the Earl of Plymouth and Mr. Frampton) that Mr. Toft's design would harmonise better than any of the others with the buildings near which the memorial is to stand. Mr. Gilbert Bayes' model, which the assessors placed second, shows, perhaps, the best modelling of all, but the pedestal is of nondescript character. "No doubt Mr. Bayes was his own architect; but life is too short for a sculptor to master thoroughly more than his own particular sphere of art." Mr. F. Derwent Wood has hardly done himself justice, and his model is lacking in grace and charm. Mr. Henry C. Fehr's model, showing Victory holding a wreath over a fallen soldier, is artistic and refined. Mr. A. Bertram Pegram's model is rather theatrical and unrefined. Mr. A. G. Walker made the mistake of being too realistic—showing a wounded soldier being succoured by a comrade—one of the conditions of the competition being that the groups should be symbolical.

Three Libraries.

Mr. Henry T. Hare, F.R.I.B.A., has been appointed assessor in the competitions for free libraries proposed to be erected at Cradley Heath (£2,500), Blackheath (£1,550), and Tividale, Staffs. (£650).

New Masonic Hall, Leicester.

In a limited competition for a new masonic hall for the Province of Leicestershire and Rutland (Mr. S. Perkins Pick, F.R.I.B.A., assessor), the design of Mr. H. H. Thomson, F.R.I.B.A., has been placed first; second, that by Mr. W. M. Cowdell, F.R.I.B.A.; and third, that by Mr. R. W. Bedingfield, A.R.I.B.A. The estimated cost of the buildings is about £8,000.

High School for Girls, Stockport.

In the competition for a new high school for girls proposed to be erected on a site at Cale Green, Stockport, at an estimated cost of £11,000, twenty designs were submitted. The assessor, Mr. J. W. Simpson, F.R.I.B.A., of London, has made the following award:—1st, Messrs. Spalding and Spalding, London; 2nd, Messrs. Cheers and Smith, Blackburn.

Appleby and Tebay New Schools.

With reference to the printed particulars issued officially in connection with the above new schools, it is now stated that the heading "Appleby and Tebay new Infants Schools" was misleading, as Appleby is to be a mixed school, only Tebay being all infants. It is further stated that though the wording of the remainder of the particulars would probably prevent any real misunderstanding, it has been decided, in view of the error, to extend the time within which competitive plans will be received to May 7th.

Schools at Anerley and Romford.

A limited competition for schools at Anerley has been won by Mr. Cecil A. Sharp, A.R.I.B.A., of Westminster, Frinton-on-Sea, and Sutton, who has been also placed first in a limited competition for the enlargement of Banstead Downs Golf Club premises. Mr. Sharp, in conjunction with Mr. A. S. R. Ley, has been further successful in winning the competition for a large elementary school for infants at Romford, for the Essex County Education Board.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
May 7	ELEMENTARY SCHOOLS AT APPLEBY AND TEBAY. Particulars from C. J. R. Tipper, Secretary, Westmorland County Education Committee, Lowther Street. Kendal.
May	DOOR AND WINDOW FITTINGS.—(Assessors, Mr. Henry T. Hare, F.R.I.B.A., and Mr. Leonard Stokes, F.R.I.B.A.). Premiums of 15, 5 and 3 guineas. Particulars from N. F. Ramsay & Co., 1, Victoria Street, Westminster.
May 14	SCHOOL AT KINGSDOWN, BRISTOL (to accommodate 500 children).—Limited to local architects. Particulars from W. A. Adams, Secretary, Education Committee. Guildhall, Bristol.
May 15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May 16	TECHNICAL INSTITUTE, COLCHESTER.—Architects desirous of competing to submit names by this date. Fifteen will be selected. Premiums, 30, 20 and 10 guineas. Particulars from G. C. Holland, Secretary, Higher Education Committee, 4, Trinity Street, Colchester.
May 19	NEW PARISH COUNCIL CHAMBERS, Motherwell (to cost £3,000). Premiums, £20, £10, and £5. Commission $3\frac{1}{2}$ per cent. Conditions from Alex. Bryden, Parish Council Offices, Motherwell, N.B.
May 20	SCHOOL AT BRIDLINGTON.—Limited to local architects. No premium. Particulars from G. G. O. Sutcliffe, Quay Road, Bridlington.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May 30	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall, Eccles, Lancs.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
June 6	SECONDARY DAY SCHOOL SHREWSBURY (70 Boys and 70 Girls).—Conditions from W. H. Pendlebury, Secretary, Higher Education Committee, Shire Hall, Shrewsbury.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Particulars in BUILDERS' JOURNAL, April 29th. Conditions from the Secrétariat de l'Association du Monument de la Réformation, 56, Rue du Stand, Geneva.
1909. Jan. 1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date; final competition to be limited to six competitors.

QUANTITY SURVEYORS' ASSOCIATION.

Annual Dinner.

The annual dinner of the Quantity Surveyors' Association was held at the Criterion Restaurant on Thursday evening last. The president, Mr. W. R. Hood, F.S.I., occupied the chair, and among those present were Mr. A. W. S. Cross, M.A., F.R.I.B.A., Mr. Walter Cave, F.R.I.B.A. (president of the Architectural Association), Mr. J. Dixon Butler, F.R.I.B.A., Mr. T. W. Aldwinckle, F.R.I.B.A., Mr. William Lawrance (president of the London Master-Builders' Association), Mr. Walter Lawrance. F.S.I. (past-president of the Quantity Surveyors' Association), Mr. H. H. Bartlett (of Messrs. Perry and Co.), Mr. Frederick Higgs (president of the Builders' Benevolent Institution), Mr. J. Carmichael (president of the Institute of Builders), Mr. A. A. Hudson, Mr. H. T. A. Chidgey, Mr. S. Chatfeild Clarke, and Mr. A. G. Cross (hon. secretary of the Association).

The Royal toasts having been given, Mr. A. W. S. Cross proposed "The Quantity Surveyors' Association, and its President." After referring to the fact that the membership of the Association was increasing, and observing that no society which aspired to represent a great profession could be regarded as in a satisfactory condition unless its membership showed a continual upward tendency, Mr. Cross went on to speak of

the Proposed Standardisation of Quantities.

He pointed out how varied were the systems now in vogue, there being one system in London, another in Glasgow and Scotland, another adopted by the Manchester Society of Architects, another by the Northern Quantity Surveyors' Association at Newcastle, and another by the quantity surveyors in Belfast. None of the systems agreed with one another, and it was becoming increasingly desirable that this difference in methods of quantity taking should be ended. He cited the case of a busy architect, who might have to refer in one day to four different sets of quantities—all drawn up in a separate way. This added to the burden of an architect's practice, and he was sure therefore that architects would support the movement to obtain a standardisation in quantities. He observed that the Devon and Exeter Society had already taken the matter up, and he expressed the conviction that architects elsewhere would support them. Speaking of the American system of carrying out contracts, in which the builder did a certain amount of work for an agreed percentage on the prime cost, he said that he could not see that this was so good as our own method of having a properly arranged contract at the beginning, with quantities. Quantity surveyors might, perhaps, be in a different condition to architects, but architects certainly found that their clients wanted to know how much a building was going to cost, and to arrive at that result in a really definite manner, it was essential that proper quantities should be taken out.

Mr. W. R. Hood responded. He said that although the Association had only been started a few years ago, it had established a position for itself, and its membership was increasing—not by leaps and bounds (which was a thing they did not desire), but in a steady, satisfactory manner. Membership of the Association, moreover, was not easily achieved, and it would become still more restricted in the future, because, following the lead of other associations of a similar character, they had decided that at the end of the present year the doors of the Association should be closed to all except those who had qualified by examination; and even the passing of that examination—a searching one—did not necessarily entail membership, for the candidate would be required to make application to the council for membership, and the council had power to defer his qualification, or to hold over his application until, if necessary, he had acquired practical experience. In this way the Association would consist only of thoroughly qualified men. Turning to the finances of the Association, Mr. Hood said these were satisfactory and improving. It was not their intention, however, to build up any large reserve, except for the benevolent fund of the Association, which object he commended to members as being highly deserving of their support. In connection with

the Increasing Employment of Iron and Concrete Construction

he emphasised how necessary it was that quantity surveyors should pay special attention to the taking-off of quantities for this work. There was a tendency at present to oust the quantity surveyor from a large number of important contracts, and unless the profession paid particular attention to this matter they would find the work going out of their hands. He thought that the method of inviting quantity surveyors to tender for the supply of quantities was iniquitous. Nothing was more detrimental to the status of the quantity surveyor than to have to tender in this way. The Association had issued a scale of fees with the object of preventing the acceptance of fees which were less than the minimum, and this was highly necessary, for he had known of quantity surveyors taking fees which really they should have been ashamed to accept. The position of the quantity surveyor was often not appreciated as it should be by the many members of public authorities, and the Association had considered it desirable to memoralise the president of the Local Government Board on the subject. In a recent Act it was stated that on all those works which required the sanction of the Board, only architects approved by the Board would be employed, and in the same way he urged that only quantity surveyors approved by the Board should be employed. It frequently happened that work was undertaken at low fees by young men who did it in the evening, or "farmed" it out; this was not as it should be. Another matter to which quantity surveyors should give attention was the assessing of fire losses. Who was so qualified as the quantity surveyor to do this work? He should make a special duty of it, in so far as the law of policies and dilapidations was concerned, and thus qualify himself to secure work which came essentially within his own sphere.

Mr. H. T. A. Chidgey proposed the toast to "The Architects." Without architects, he said, there could of course be no quantity surveyors; the one profession was the complement of the other; and just as it would be possible to say something on the subject of quantity surveyors' architecture, so might one find matters correspondingly of interest in architects' quantities. But he asked architects to believe that quantity surveyors were not what they were sometimes represented to be—miserable creatures whose single idea was to add to their fees! It was essential, of course, that they should be well "fee'd" in order to be fed, but he urged that they had interests of a far higher character; and in the formation of their Association they had aimed at focussing the best men, so that architects, when employing members of the Association, could rely on having only those quantity surveyors who were thoroughly trained and qualified.

Mr. Walter Cave responded. He echoed the opinion expressed as to the close relations which existed between the architect and the quantity surveyor, and pointed out how they were all working to one end—the production of good buildings—in which endeavour the co-operation of all undertakings connected with the building trade was essential.

The Builder and the Quantity Surveyor.

Mr. T. J. Carless proposed "The Contractors." He observed that there were various kinds of contractors—some good—some better—some best; but, of course, all those present that evening came under the last-named category. The best contractors, indeed, might be likened to their first-quality deals (if he might be permitted to make the allusion), for they were free from the sap of greed, their finances were not shaky, they did not raise knotty points as to loose verbiage in the specification or quantities, and they had sound experience.

The toast was responded to by Mr. William Lawrance, president of the London Master Builders' Association, who said that builders were fully in sympathy with the objects which the Association had in view. A perfect bill of quantities was one of the best safeguards, but he was afraid that all the quantities which the contractor had to deal with were not so ample as they might be, there being such items as "Provide £10,000 for ironwork, £5,000 for granite," and so on, leaving the builder to provide only the brickwork and the water, and to take the whole responsibility!

Mr. C. W. Ball proposed the toast of "The Visitors," which was responded to by Mr. J. Dixon Butler, F.R.I.B.A., and Mr. G. A. Wright; Mr. Butler observing in the course of a humorous speech how the enthusiasm of the architect was tempered by the attention of the quantity surveyor to small details, such as a wall on an upper floor for which the architect had not provided any support.

Mr. Wright, as an architect in San Francisco, mentioned how, twenty years ago, he had attempted to introduce the quantities system into that city, and how fruitless his effort had been. The American system was one of so much work for so much money. Architects wrote their own specifications, of which about a dozen copies were taken, with an equal number of copies of the drawings, and the work was divided up among the competing contractors.

The Newellite Glass Tile Co., Ltd., of Shenton Street, Old Kent Road, S.E., have recently secured the order for tiling the Franco-British Exhibition Station on the Central London Railway, the contractors being Messrs. Mowlem and Co., Ltd., and the engineers Messrs. Mott and Hay.

Our Plate.

Stockport Town Hall.

The new town hall at Stockport is now nearing completion. Designed in eighteenth-century English Renaissance style, the front is carried out in Portland stone, while the sides and back are of red brick, with Portland-stone dressings. The clock tower, which is 140 ft. high, is 18 ft. square at the clock storey, above which is an open cupola. The public hall (shown on the accompanying upper-ground floor plan) is 114 ft. by 52 ft., and will seat 1,250 people, the gallery having further accommodation for 250; there are six exits. The ante-room at the back of the stage is 35 ft. by 25 ft. Oak panelling, plasterwork, and appropriately-designed electroliers give the hall a dignified appearance. The council chamber is planned in the form of a Greek cross. It is 114 ft. by 62 ft., with about seventy seats, and is well lighted, having a lofty dome and large windows. The oak benches, ranged in horseshoe form around the mayor's seat, are somewhat elaborately carved with fruit and cherubs, after the manner of Grinling Gibbons. Stained - glass windows, designed by Mr. Geoffrey Webb, of London, illustrate incidents in the history of Stockport. As shown on the plan, the three committee-rooms are divided by sound-proof screens, which can be raised to convert the three apartments into a single room. The middle committee room is 30 ft. by 20 ft., the other two being 30 ft. by 17 ft. The architect, Sir A. Brumwell Thomas, F.R.I.B.A., of London, had to deal with a site that was at one side about 25 ft. lower than at the other, but, by judicious levelling, he has contrived to place the principal entrances at the pavement level. The estimated cost of the building is £100,000, including £14,000 for the site and £10,000 for furniture. Mr. Josiah Briggs is the contractor. The photograph which we publish is by Messrs. E. Hulton and Co., of Manchester.

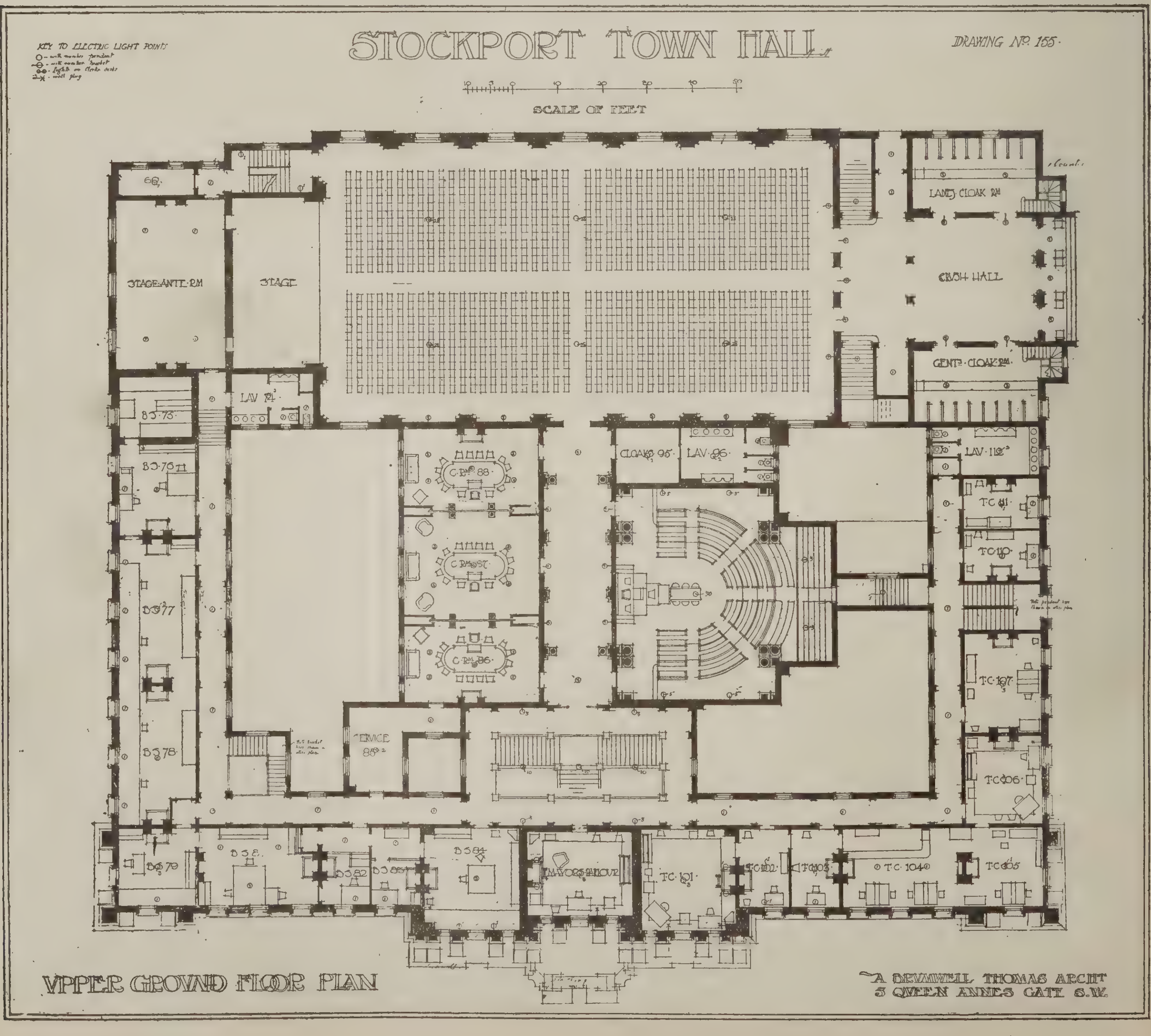
The British Flooring Co., of 152, Gray's Inn Road, W.C., have secured extensive contracts for marble, mosaic, wood block, and "Cementolith" floors in the following new works:—Sailors' home (Messrs. Olley and Haward, architects) and new hall, Marine Parade (Mr. A. S. Hewitt, A.R.I.B.A., architect), Great Yarmouth; co-operative stores at Birmingham, (Mr. F. B. Andrews, A.R.I.B.A., architect), Seaford, Sussex, and Egham; and a fourth contract at the Assay Office, Birmingham (Messrs. Ewen Harper and Brother, architects).

Obituary.

Mr. Robert Brelsford, contractor, of East Keswick, died recently.

Mr. A. W. Weedon, R.I., a well-known water-colourist and instructor in water-colour painting at the Architectural Association from 1886 to 1899, died at West Hampstead recently, aged 69. Readers will remember that a presentation of one of Mr. Weedon's water-colours was made to the Architectural Association in October last by some old pupils who subscribed towards the purchase of it.

Mr. James Bertwistle, F.S.I., architect, surveyor, and valuer, who died recently, aged 71, at Blackburn, had built churches, vicarages, mills, and breweries in that district, but he was perhaps known even better as a valuer than as an architect. From 1877 to 1881 he acted as valuer to the Blackburn Union, and subsequently to the county borough area of the Union; while for the past fifteen years he had been retained by the Blackburn borough magistrates for the valuation of licensed premises within their jurisdiction. He was an enthusiastic antiquary, and it was under his supervision that the actual lines of the Roman camp at Ribchester were disclosed.



IMPROVEMENTS IN DECORATORS' MATERIALS.*

By Arthur Seymour Jennings.

The object of this paper is to draw attention to some of the more important of the improvements made during the last decade in the materials and plant used by house-painters and decorators. Paint has been likened to insurance in the sense that the cost is a tax on property; but it is a very necessary one when the preservation of that property is taken into consideration.

Substitutes for White Lead.

Perhaps the most important development of comparatively recent date is the increase in the use of various white pigments other than pure white lead. For very many years white lead has held the premier position in the minds of the public as the base of all good paint, but investigations continued during the last ten years or more have shown conclusively that while white lead possesses excellent qualities in some respects, it is woefully deficient in others. But its shortcomings may to a great extent be overcome by mixing it with other pigments. White lead possesses the advantage of having great "body" or opacity when ground in oil to form a paint, and this is an important quality, because when a paint is deficient in body an additional coat may be necessary in order to hide completely the surface to which it is applied. White lead works easily under the brush, forming when ground with oil something of the nature of a lead soap. On the other hand, it is poisonous, and very susceptible to the action of sulphuretted gases, as well as to the damaging effects of sea air. As sulphur is present in the atmosphere of all large towns, it will be seen that white lead is by no means the ideal pigment that it is generally supposed to be. What pigment can be recommended for use in place of white lead? The most important is zinc oxide, or, as it is frequently called, zinc white. This beautifully white pigment is used to a very large extent on the Continent and in America, and is rapidly increasing in popularity in this country. It is quite innocuous, the particles of which it is composed are very fine—a point of importance—it is not visibly affected by sulphurous fumes, and unlike white lead it may be mixed with any other pigment or colour containing sulphur, without affecting them, or itself being affected. When ground in oil, it forms a paint which, if properly applied, has been proved to be exceedingly durable, especially in those situations which are specially destructive to lead paints. For a surface that is to be finished white, it may be looked upon as the best pigment at the command of the decorator. In coloured paints it may be used as a base, as its durability is then equally of advantage, particularly so as the purity of the tints will be maintained better than when lead is used. The best grades of zinc oxide are quite white, while the lead is comparatively yellow. Mr. J. Cruickshank Smith, in a paper read before the Institute of British Decorators, gave the covering capacity of 1 cwt. of white lead when mixed to a proper consistency for application at 800 sq. yds., and of zinc oxide at 1,400 sq. yds. The same quantity of red lead he estimated would cover 600 sq. yds., and of iron oxide 1,100 sq. yds. No doubt the use of zinc oxide would have even greater progress towards popularity in this country if painters knew better how to mix and apply it.

"Lithopone."

Before passing to a consideration of mixed paints I may describe a few other pigments which seem to merit attention. The group of pigments of which "Lithopone" is a type, were invented by J. B. Orr, in 1880, and were sold under various names, such as Orr's White, Charlton White, and various other arbitrary terms. "Lithopone" consists of 25 to 33 per cent. of zinc sulphide and 75 to 66 per cent. of barium sulphate, commonly known as barytes, a mineral which has always been largely used as an adulterant of white lead. But the sulphate of barium contained in "Lithopone" is in no sense an adulterant, as it forms part of the pigment itself. "Lithopone" has excellent body, and is very largely used for interior decorations. It is also used in the cheaper grade of enamel paints. This class of paints cannot be used in conjunction with lead paints, as the sulphur contained in the sulphide of zinc is likely to cause a change of colour.

Graphite

is another pigment which is being used to a considerable extent in this country for the protection of iron. Graphite is not used alone, as it would produce too thin a film to give good protection, but when it is mixed with silica very good results are obtained. Graphite paints when dry give a very smooth and slippery surface, to which it is probably due that the graphite paint lasts so long. It is well understood that all paint exposed to the elements are caused to decay largely by the agency of water. The rain gathering upon the surface carries with it acids, sulphur, etc., and these attack the paint. In the case of graphite, however, the water is not retained, but gathers up in drops as though upon an oily surface.

Fast Reds.

"Fast reds" are rapidly taking the place of quicksilver vermilion, which, of course, is sulphide of mercury. Most of these are made from what are known as Para-mitraliline lake. These are precipitated on to a base, but they cannot be mixed with white lead. The colour is very strong and as permanent as vermilion, or even more so, and they are much cheaper. It appears likely that mercury vermilions will soon be driven from the market by them.

Green Pigments.

Very considerable improvements have of late been made in the manufacture of greens used by house decorators. Brunswick green, which has been so largely used, possesses the disadvantage that it quickly fades, but the series of greens are practically free from this defect, and are moreover made in many pleasant and useful shades.

Ready-made Paints not an Unmixed Blessing.

Until a few years ago, nearly all the paints sold mixed and ready for use were either of a very poor quality, intended only for the use of amateurs, or were certain special paints brought out for special use. Twenty-five years ago in America very few mixed paints were sold. To-day it is estimated that the annual production there is no less than 70,000,000 gallons per annum. A good deal is to be said in favour of mixed paints and a good deal against them. The advantages of those mixed paints which are made from the best materials and are intended for the use of decorators and painters who do really good work are, stated briefly, the saving of labour in mixing and the decreased cost. Paint-mixing in ordinary circumstances is a very primitive process. The lead ground to a stiff paste in oil is broken up by means of a paddle or stick, and the colour and thinners are gradually added. The component parts of ready-mixed paint are, of course, very thoroughly and economically incorporated by means of machinery; and experience has proved very conclusively that the intimate mixing and fineness of grinding bears a very important part in determining the actual wearing qualities of any paint. Again, when a paint is made from a mixture of different pigments, it is essential that the actual admixture be very thorough, and this can only be brought about by mixing in a machine. The objections urged against ready-mixed paints are, first, that as the condition of different surfaces to which the paint is to be applied varies considerably, it is necessary for the practical painter to mix his paint according to the circumstances, using more or less pigment and thinners as may be necessary, and that a uniform paint, ready mixed, would therefore often be useless. Another objection is that in order to produce a good decorative effect a colour should be mixed in the actual room in which it is to be used. As against these arguments there is the fact that perhaps only a proportion, say 20 per cent., of all the paint work usually done is abnormal or requires special mixing, and in those cases special paints could be mixed to suit the circumstances. In the other 80 cases the ready-mixed paints could be used with a saving of money. Another objection which has been raised to this class of paints is that as they are prepared ready for use they must contain driers, and that as there is always a space left in the sealed can containing air, the paints, if stored for any length of time, will, as the painters say, "go fatty," that is, the process of oxidation will commence. There is, no doubt, much truth in this, but it might be possible to label the cans with the date they are sent out from the factory, so that they might be used within a reasonable length of time, and if not sold within that period, they should be returned to the manufacturers, who would, no doubt, very readily regrind them, and, by adding extra thinners, make them again into good paint.

Gilding.

Turning now to a consideration of some of those improvements in decorators' materials and methods which are more closely connected with decoration, there is first the application of gold leaf to various surfaces. For very many years the practice has been to reduce the gold leaf to squares of 3¼in. and to enclose these in books containing 25 leaves of paper, which is treated with powdered bole to prevent the gold from sticking. A very great saving of time is effected by producing the gold leaf in long ribbons, varying in width according to the surface to be covered. As a rule, gilding is done in lines, and the ribbons of gold are made in widths varying from $\frac{3}{16}$ to 3¼ins. The ribbon of gold is interleaved with paper and rolled to form a wheel, this wheel being enclosed in an instrument, simple in construction, which permits the gold being applied in long

*Abstract of a paper read before the Royal Society of Arts on March 25th.

lengths to the tacky surface with almost a stroke of the arm. In order to reach inequalities of surface, as for example, in gilding an ordinary egg and tongue moulding, a second pattern of the little appliance is made, which is provided with a small stiff-haired brush of a width corresponding with the width of the ribbon gold, and by means of this the gold leaf may be expeditiously caused to adhere to the tacky surface. I understand that the actual cost of the gold leaf thus prepared is somewhat higher than that of the ordinary form in books, but the saving of time is so great that a conservative estimate is to put the saving of cost of any ordinary piece of gilding at perhaps one-half of that executed by the old method.

Alabastine.

This is supplied in the form of a dry powder, and when mixed with water gives a paint which sets very hard. In addition to its use as an ordinary distemper, some very novel effects may be produced by preparing a coloured coat, placing upon this a white coat, and while wet manipulating it in such a manner as to remove some portion of the coat, showing the coloured surface beneath. In other words it is treated in the same way as graining, but with the difference that no attempt, of course, is made to imitate a wood. When a very thick coat of this material is applied and a board is pressed against it, and is then gently pulled away, the material is drawn out in the form of small irregular "hills," so to speak, which give a very pretty appearance and which may be produced very inexpensively. The irregular surface lends itself readily to being ornamented with gold leaf or gold paint in various colours. In finishing a frieze a good effect may be produced at a very little cost by treating the surface in the manner indicated and then forming medallions at suitable intervals. These medallions are usually formed by the simple means of pressing the back of a dinner plate on the material while wet, and then working up the surface contained within the circle to an appropriate design.

Alabastine Opalia.

This is a stiff paste-like material, similar to gesso, and sets as hard as rock when dry. The material is placed in a soft rubber tube fitted with a brass nozzle. Various shaped nozzles are provided, and the Opalia is squeezed on the surface of the wall or ceiling, and by a little skilful manipulation many excellent effects may be produced. When a nozzle having a plain slot orifice is used, the material as squeezed out comes in the form of a ribbon which may be twisted and otherwise regulated with excellent effects. Such details as husks, so largely used in the "Adam" designs, may be very quickly produced by this means, and designs executed in this way have the charm of being evidently prepared for the particular position they occupy.

The Aerograph.

Since the "Aerograph" was fully described by its inventor, Mr. Charles L. Burdick, before the Society of Arts in December, 1905, decorators have employed this instrument for stencilling instead of a brush, in figure work and for mural decorations generally. It has been found that when the instrument is used a great saving of time is effected, and although the colour is blown on to the surface, instead of being applied by a brush, great delicacy and softness of detail may be obtained, and the instrument is profitably employed in connection with the production of hand-worked wallpaper friezes, which are now produced in large quantities and sent out ready for fixing like ordinary papers.

By means of the so-called

Painting Machines

oil paint, distemper or whitewash, may be applied to a surface by being blown to it by compressed air in the same way as is the case with the Aerograph, excepting that the nozzle of the instrument is different. These machines can undoubtedly be used profitably instead of a brush for the application of oil and other paint in many cases where great smoothness is not necessary. I do not think, however, they will ever take the place of brush-work in house painting. But in some cases better work can be done by the machines than could be effected by the brush—as, for example, a very rough brick wall which is to be limewashed. In such a case the spray of limewash thoroughly reaches all the interstices, and this would be very difficult to do with a brush. The saving of labour when a paint spraying machine is used is very considerable—50 to 60 per cent. saving is not an exaggerated estimate. In painting ironwork and large surfaces generally, these machines can profitably be employed, provided that, as already stated, it is not important that the surface be quite smooth, as would be the case when brushes were used. Briefly stated then, painting machines are excellent when a large surface is to be covered and when the paint to be applied is not very thick. If it is thick the nozzle of the spraying machine is likely to become choked up.

Jute Fabric Wall Coverings.

Another interesting type of mural decoration which has come into use during the last few years is the class of jute fabrics which are used as wall coverings, sometimes plain, but not infrequently printed or stencilled with simple conventional designs. These fabrics are supplied in many different colours of charming hue. They are very durable, and form an excellent background for pictures, and they have, therefore, been employed to a considerable extent in the decoration of various art galleries. The fabrics are, as a rule, somewhat coarse in texture, which, from an artistic point of view, is a distinct advantage, as it breaks up and softens the surface when viewed from a distance in a very satisfactory manner. Nearly all these fabrics are made in Scotland, although some are exported thence to America and reimported into Great Britain after having been dyed in a special manner.

"Matsine"

may be described as a series of oil varnish transparent colours which may be used to produce novel and artistic effects. It is made in 13 different colours, and dries semi-flat. It may be used with excellent effect for ordinary graining, but it may also be employed with satisfactory results by using a dark colour over a light ground and drawing a brush over the "Matsine" while wet, which will remove a portion of it and leave the bright surface underneath showing through. The process is very economical.

Enamel Paints.

Perhaps the most important development in decorators' materials and methods in recent times is represented in the introduction of enamels, japans, or enamel paints. An enamel paint may be said to consists of a pigment (usually zinc oxide), ground in a special varnish, or in a specially treated oil, which causes it to dry with a brilliant gloss. Enamel work, of course, has been used for very many years, and of the beautiful white enamelled woodwork of former years examples are still sometimes to be found in old mansions. This work, however, as formerly executed, was very expensive, necessitating as many as seven to ten coats, with careful rubbing down between them, the final coat being a pale and very expensive varnish. Good enamel work can be done nowadays in three-coat work, for 1s. a yard super. for all labour and materials, and as it will last in good condition for years it is very economical. White enamels are the most popular, but enamels may be also had in colours, or may be tinted as required. It is essential to success that a perfectly level surface be obtained upon which to apply the enamel: the usual plan is to give first a coat of white lead, or a special filler made by the manufacturer of the enamel, and then a coat of white paint made of half lead and half zinc oxide or some other special mixture, and finally a coat of pure zinc oxide, finishing with one or two coats of enamel. It is well to consider the enamel itself almost in the nature of a varnish, to see that the surface underneath it is quite white and quite level, and to apply the enamel just in the same way as a varnish, that is to say, "flow it on" instead of brushing it out. Flat enamels are another triumph of the paint and varnish makers' art. Briefly, these paints may be said to combine all the beauty and softness of a distemper with the durability of a first-class oil paint. As the name signifies, they dry perfectly flat or without gloss. The best brands are easily applied, and flow without leaving signs of brush marks. Flat enamels may be used very effectively in conjunction with glossy enamels; thus, for example, the panels of a door can be put in flat and the stiles and rails glossy. When a surface is somewhat uneven it is often more economical to finish it in flat enamel than it is to go to the expense of bringing up the level in the ordinary way. The flat enamel hides the inequalities while the glossy enamel accentuates them.

Washable Distempers.

Washable distempers or "water paints" have been available for some thirty years, but it is only during the last ten years that their advantages have been very widely understood. As a wall decoration they give a perfectly plain surface, which is often—one might almost say generally —most satisfactory as a background to pictures and furniture, and as they are made in more than one hundred different colours, there is no difficulty in getting any shade or hue required. It is not too much to say that the enterprise on the part of the manufacturers of washable distempers has improved to no small extent the standard of mural decorative art in this country. We have broken away from the old idea that effective decoration meant the crowding of ornament into every available inch of wall surface, and we have arrived at a point where it is understood, in part at least, that walls for decorative purposes must be considered as a background to our pictures and our furniture, and must be dealt with accordingly.

R.I.B.A. Prizes and Studentships, 1909.—The pamphlet giving particulars of these prizes and studentships has now been issued by the Institute, 9, Conduit Street, W., price 3d.

FIRE-RESISTING CONSTRUCTION SECTION.

(MONTHLY.)

THE CONCRETE INSTITUTE.

Concrete and reinforced concrete are playing such an important rôle in matters appertaining to fire prevention that it is particularly valuable, in the interests of safer construction from the fire point of view, that the Concrete Institute (which has been referred to in previous issues) has come into being, and we take the opportunity of this issue of our "Fire-Resisting Construction Section" to give our readers notice that not only has the Institute been successfully constituted, but its objects and the members of its first Council have now been announced.

Its Objects.

The following is a summary of the objects of the Institute:—

(a) To advance the knowledge of concrete and reinforced concrete, and to direct attention to the uses to which these materials can be best applied.

(b) To afford the means of communication between persons engaged in the design, supervision and execution of works in which concrete and reinforced concrete are employed (excluding all questions connected with wages and trade regulation).

(c) To arrange periodical meetings for the purpose of discussing practical and scientific subjects bearing upon the application of concrete and reinforced concrete, and to conduct such investigations and to issue such publications as may be deemed advisable.

We think these objects are eminently comprehensive, without extending beyond undue limits, and we are particularly glad to observe that all questions connected with trade regulation are excluded from the "objects."

It will no doubt take some time before the Institute is in full working order, and it is scarcely to be anticipated that its general meetings, with papers and lectures, will be held until the autumn. In the meantime, however, the council should have ample opportunity to set out a programme of work, to arrange for the preparation of papers, and, above all, to consider what questions of research work and what questions of essential interest to the professions and industries concerned should be first taken up. There is a multitude of such matters that have to be dealt with, more particularly in regard to reinforced concrete.

Membership.

Regarding the membership, we observe that the following qualifications have been laid down:—

(a) Persons professionally or practically engaged in the application of concrete or reinforced concrete, and the production of their constituents.

(b) Persons of scientific, technical or literary attainments specially connected with the application of concrete, reinforced concrete and their constituents.

Here, again, we are at one with the arrangements, for we see that not only are the professional men allowed to gain membership, but also the industrial chiefs whose experience counts for much in the intricate problems of reinforced concrete construction. There is also room in the Institute for the scientific, technical, and literary community; this is as it should be; in fact, one can see that the Concrete Institute has been moulded on the lines of that excellent institution known as the Iron and Steel Institute, which has done so much for the development of the iron and steel trade of this country during the past forty years.

The Council.

The constitution of the first council is as follows:—

President.

The Right. Hon. The Earl of Plymouth, C.B., etc. (late First Commissioner of Works, 1902-5).

Vice-Presidents.

Sir Wm. H. Preece, K.C.B., J.P., F.R.S., LL.D., Past-Pres. Inst.C.E., etc. (late Chief Engineer, G.P.O.), Chairman of the Special Commission on Concrete Aggregates.

Sir Henry Tanner, Kt., I.S.O., F.R.I.B.A., F.S.I., etc. (Principal Architect, H.M. Office of Works), Chairman of the Reinforced Concrete Committee.

Sir William Mather, Kt., J.P., LL.D., M.Inst.C.E., etc.

Chairman of the Executive.

Edwin O. Sachs, F.R.S.Ed., F.S.S., A.Inst.M.E., etc., Chairman of the British Fire Prevention Committee.

Council.

H. H. D. Anderson; Bertram Blount, F.I.C.; C. H. Colson, M.Inst.C.E. (Supt. Civil Engineer, Admiralty); William Dunn, F.R.I.B.A.; Ben Hannen, B.A.; W. T. Hatch, M.Inst.C.E., M.I.Mech.E. (Chief Engineer Metropolitan Asylums Board); W. H. Hunter, M.Inst.C.E. (Chief Engineer, Manchester Ship Canal); W. H. Johnson, B.Sc.; Chas. F. Marsh, M.Inst.C.E.; Frank May, J.P.; J. Munro; F. Purton; A. Ross, M.Inst.C.E. (Chief Engineer Great Northern Rly.); L. Seraillier; J. S. E. de Vesian, M.Inst.C.E.; Lieut.-Col. J. Winn, R.E.; G. C. Workman.

Hon. Treasurer.

E. P. Wells.

Hon. Secretary.

A. E. Collins, M.Inst.C.E. (City Engineer, Norwich), Past-Pres. Association of Municipal Engineers.

Regarding the constitution of the Council, we think we should first of all congratulate the Institute upon its council being essentially a British one (we understand that only British subjects are eligible for membership). This is certainly in keeping with an institution intended to further British interests.

Next, it is gratifying to observe that the Earl of Plymouth (better known to architects as Lord Windsor, under which name he held office as First Commissioner of Works) is the first president, for, not only is he a peer of great influence, tact, and high business ability, but he has presided over a public department (namely, the Office of Works) which has been a pioneer in the interests of reinforced concrete.

Of the other members of council, we are pleased to see the name of Sir Henry Tanner among the vice-presidents, as his work as a pioneer of reinforced concrete and as chairman of the Reinforced Concrete Committee of the Royal Institute of British Architects has closely associated him with the problems appertaining to the subject, and it is notable that, so far as fire prevention is concerned, some of the most sensible recommendations that have been made in any rules or regulations are those contained in the report of the committee over which he presided.

Mr. Edwin O. Sachs is acting as first chairman of the Executive. He has been a strong advocate of the use of reinforced concrete and concrete generally from the early days of its introduction into modern building construction and organisation—which is a matter of importance in the early days of an Institute—is his forte.

The first honorary secretary is Mr. A. E. Collins, who, although a civil engineer by training, and holding the office of City Engineer of Norwich, has had a great deal to do with building construction, and has been generally associated with the movement towards reinforced concrete from its inception. As past-president of the Association of Municipal Engineers, he is closely in touch with the requirements of local authorities throughout the country.

Of the other members of council we can only in this issue mention that we are pleased to see that Mr. Dunn, one of the few architects who have energetically taken up the scientific side of reinforced concrete, is on the list. We also observe that the building trades and reinforced concrete specialists are ably represented, and it is interesting to note that the treasurership is in the hands of a reinforced concrete specialist designer well known to our readers, namely, Mr. E. P. Wells.

Altogether, the constitution of the Institute and its first council should be matters of considerable importance to architects. Any architects engaged in work other than purely domestic work would do well to become associated with the labours of this Institute, either as members or otherwise, for all those who have to deal with modern construction cannot fail to derive considerable benefit if the work is done as well as that which has been done by the Iron and Steel Institute.

The offices of the Concrete Institute are temporarily at No. 1, Waterloo Place, London, S.W.

A New Fire Station is to be erected in the south-eastern district of Birmingham, where 100 fires occurred last year. The nearest station, in Lime Grove, is quite inadequate to protect the district.

The Rapid Development of Hendon was commented upon at a recent meeting of the Hendon District Council by the chairman, Mr. J. H. McGrath, who stated that the area of building activity was by no means confined to the immediate vicinity of the Hampstead Tube Railway. Large estates are in progress of development in other parts of the district, one containing 11¼ miles of streets. Plans had been approved for 62 new streets, of a total length of 18¾ miles, and during the official year just ended applications for 932 new houses, shops, etc., had been passed. The number of houses in course of erection at the present time is 391.

AUTOMATIC FIRE EXTINCTION AS APPLIED TO FACTORIES.*

By Geo. T. Bullock, A.I.E.E.,
Chief Surveyor to the Union Assurance Society.

In laying out works or factories the engineer or architect will probably be called upon to consider the best and most effective means of preventing outbreaks of fire, and also of reducing to a minimum the amount of damage likely to be sustained in the event of an outbreak occurring. One of the most effective means of extinction is by automatic mechanical appliances.

Sprinklers.

To America belongs the honour of originating a practical form of sprinkler. In the early 'seventies Mr. H. S. Parmalee (who, by the way, was a pianoforte manufacturer) brought out a type known by his name, which was put into use in that country, and introduced into England about the year 1880, when, after many private and public tests, it was adopted by one or more firms in the Bolton district, and recognised by one of the insurance companies as deserving of some consideration in the premium charged for the insurance of premises so protected. This was of the "sealed" type (Fig. 1), which is now obsolete. It will be observed from the illustration that this type is valveless, the water being confined by a cap (C) soldered to the body of the sprinkler, and although it rendered good service, the type was doomed to failure owing to the necessity of heating the water to the melting point of the solder before it could be released; whilst there was also a tendency for the cap to stick, unless the heat was fairly great, on account of the somewhat large area of the soldered surface.

The "Vulcan" (Fig. 2), an invention from Manchester in 1887, was also of this type, with the exception that a deflector (D) was fastened to a spindle and cap, which was also in contact with the water. It soon became evident that this type and form of construction was wrong, and various designs of valve sprinklers were patented, chiefly in America, in which the valve was secured by fusible solder free from contact with the water; in fact, about fifty different types in many varied forms have been introduced, with little or much success. The first of the valve type to achieve success was introduced from America in 1884, and was known by the name of its inventor, "Grinnell" (see Fig. 3); its chief and most important feature being its increased sensitiveness owing to the solder S not being in direct contact with the water. This sprinkler was soon recognised as a vast improvement upon the former types, and at that period practically formed the standard by which comparisons were made in testing other types. Many thousands were fitted throughout the country, and although various modifications have since from time to time been made in subsequent designs, it still holds a foremost position amongst those on the market.

Another sprinkler, the "Witter" (Fig. 4), was invented by a Mr. T. Witter, of Bolton, in 1885, and was of a similar class to the "Grinnell," but differed from it in construction.

*Abstract of a paper read before the Junior Institution of Engineers on March 13th, 1908.

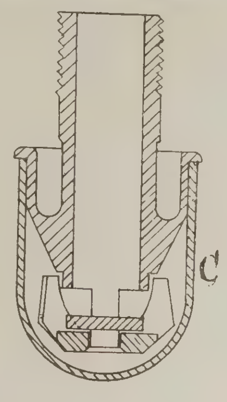


FIG 1. PARMALEE.

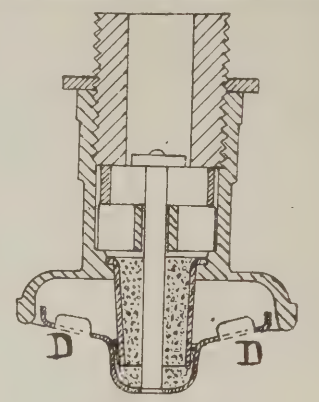


FIG. 2. VULCAN.

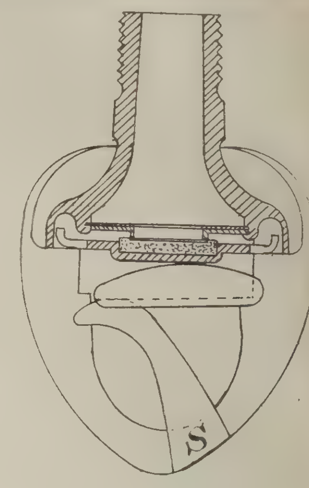


FIG. 3. GRINNELL.

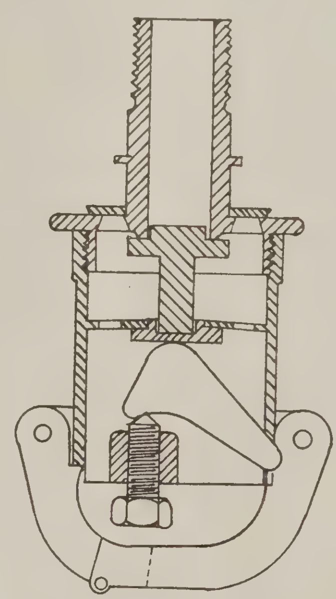


FIG. 4. WITTER.

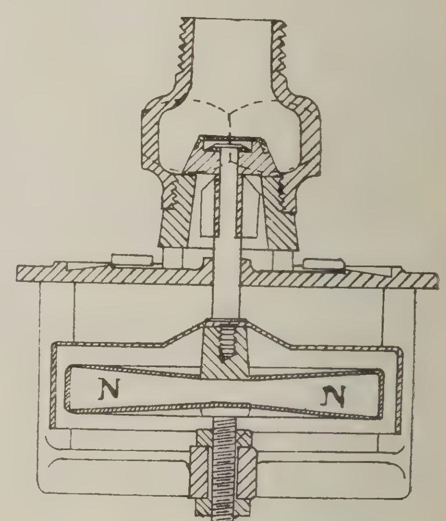


FIG. 5. DRAPER HETHERINGTON.

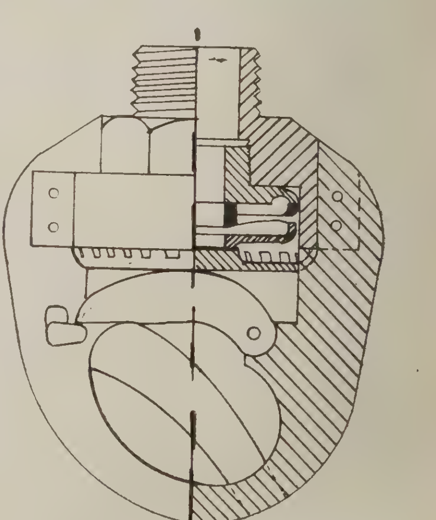


FIG. 6. GALLOWAY.

The efficiency and reliability of automatic sprinklers having been proved, their application for protection of property became general; they were adopted by insurance companies as an additional form of fire extinction, and in 1885 a pamphlet of instructions as to their application and erection for various classes of property was issued. This recognition soon brought many types into the field, each having some distinguishable feature, among the foremost being the "Draper Hetherington" (Fig. 5), an ingenious device, which consisted of a head to which was attached a frame, on which was fastened an expansion case (N) of thin brass, cylindrical in shape, the upper and lower covers being concave. This case contained a special mixture (alcohol, ether, etc.) which boiled at a low temperature. When the air around the sprinkler began to be heated, the case expanded and raised the valve spindle, opening the sprinkler; when the fire was extinguished and the air cooled, the "case" contracted again, bringing the valve spindle on to its seat. Owing, however, to the possibility of water being too promptly shut off by the action of the "expansion case," before the fire was fully extinguished, it was never officially recognised.

The "Garrett" was also of the self-closing type, and consisted of a tube within a tube, the outer one being expansive and the inner contractive. The heat expanded the outer tube, liberating the valve seat and opening the valve. A small quantity of water entering the inner tube contracted it, and it was so arranged that it was equivalent to doubling the expansion on the outer tube. Upon the extinction of the fire the valve reseated itself by the contraction of the outer tube, and thus shut off the water. Another type of which little was heard was "Douse's patent fire check" (both electrical and automatic), which required chemicals, but these have never been

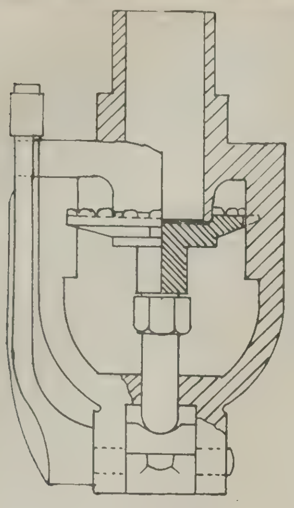


FIG. 7. WALWORTH.
(Link.)

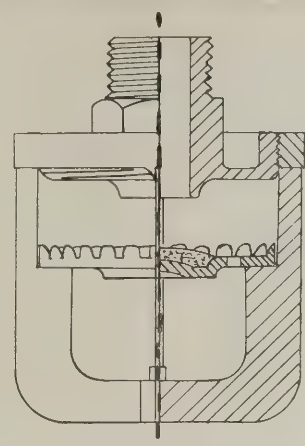


FIG. 9. HUDSON.

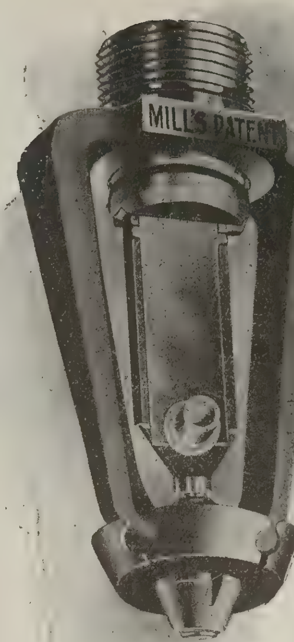


FIG. 11. MODERN TITAN.

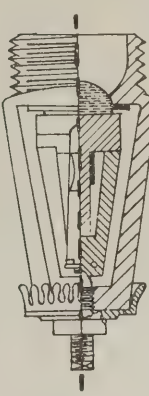


FIG. 12. BEECH.

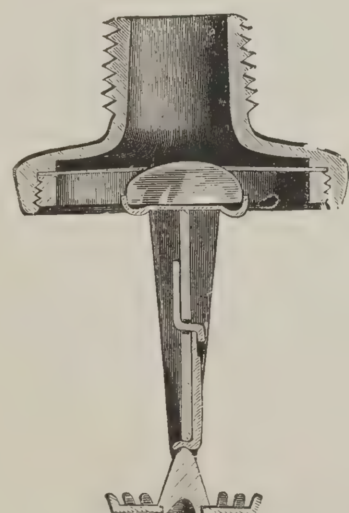


FIG. 10. SECTION OF GRINNELL.

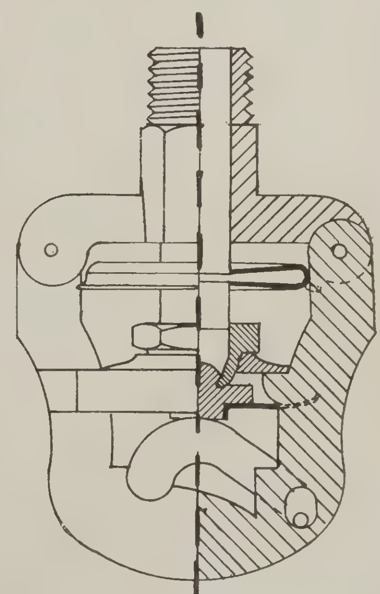


FIG. 8. MAYALL.

recognised as fulfilling the stipulated requirements.

The Perfect Type.

A sprinkler, in order to be considered of a perfect type and reliable under all conditions, should be simple in design, mechanically strong, the fusible joint having the maximum of sensitiveness, free from all possible contact with water, proof against leakage, and having an equal distribution over its area.

The type which came into general use may be described as an apparatus consisting of a metal body to which is attached a fusible metal lever or strut supporting a valve, the soldered joint so arranged that at a given temperature it melts, and releases the valve, which allows water to pass through an outlet (½in. diameter) on to a deflector or splash plate forming part of the sprinkler, distributing it over a given area in a shower or spray.

The fusible solder usually employed acts at a temperature of 155 degs. Fahr., and consists of :—

Bismuth	50	per cent.
Lead	25	,,
Cadmium ...	13	,,
Tin	12	,,

The alloys are also arranged to act at other temperatures, such as in the case of drying rooms, stoves, etc., from 210 degs. Fahr. upwards.

It is now interesting to note that in 1891 the following sprinklers were recognised as fulfilling the required conditions, of which only the first four ever came into general use :—The Grinnell (Fig. 3), the Witter (Fig. 4), the Walworth (Fig. 7), the Titan (Fig. 11), the Galloway (Fig. 6), the Mayall (Fig. 8), and the Hudson (Fig. 9.)

At the present time those approved by the Fire Offices are the Grinnell, of which there are three types, one being for high temperatures), the Witter (Fig. 4 of two types, one being for wet pipe installations only), the Titan (Fig. 11), the Beech (Fig. 12), the Hoffmann (Fig. 13), the Morris "B," 1907, the Metropolitan (originally known as "Gorton," Fig. 14), the International (Evans 1902 model, Fig. 15), the Albion (Fig. 16), the Laconia (Fig. 17), and the Record.

Of these, the Beech, Metropolitan, Laconia and Albion are now but little heard of; the Record has only recently passed the tests of the experts, and at present no particulars are available.

Reference may also be made to the Witter design of 1898, which is now provided with a tripping piece on the deflector.

The sketches obtainable of the principal types show that the fusible joint is now kept clear of the water, the valve upon being released falling clear of the head. It will also be noticed that the valve in some types is kept in position by a direct strut composed of parts, whilst in others it is supported on the cantilever principle. Various advantages are claimed by the manufacturers for the particular type introduced by them, but it is not desirable in this paper to discuss the merits or demerits of each, having regard to the fact that they have each received the recognition of the Fire Offices, and when buildings are protected by an approved installation of any one of these types a substantial discount is allowed on the premiums charged.

Having necessarily dwelt at some length with types of sprinklers, it should be stated that although sprinklers have had a wonderful record throughout the world, it is not intended that they should take the place of ordinary extinguishing appliances, but are to be considered as an additional and valuable means of protection.

General Arrangements.

In order to achieve the best results it is necessary that sprinklers should be installed in buildings in a prescribed form of arrangement, consisting of a series of horizontal pipes supported near the ceilings or roof, and connected with rising mains, having a source of

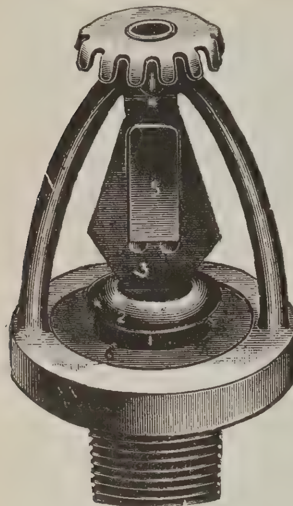


FIG. 13. HOFFMANN.

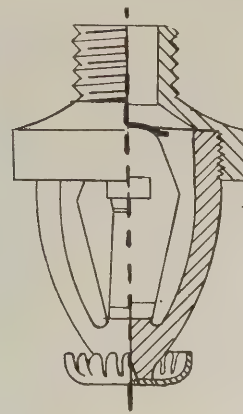


FIG. 14. METROPOLITAN OR GORTON.

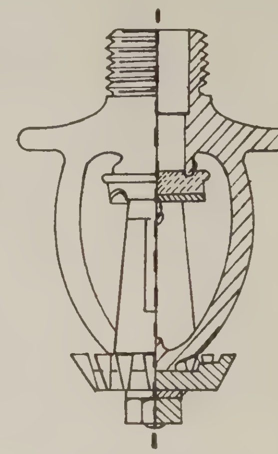


FIG. 17. LACONIA.

FIG. 16. ALBION.

supply that will enable the water to be kept at a constant pressure, one supply at least being practically unlimited. To the horizontal pipes are attached the sprinklers or "heads" at stated intervals, averaging generally 1 to every 100 ft. super. of floor area. In the event of an outbreak of fire at any point, the temperature of 155 degs. Fahr. is soon reached, and that being the degree at which the soldered joint is ordinarily set, the solder melts, and releases the valve of the particular head, each sprinkler acting independently. The water, which is under pressure in the pipes, is distributed on to the fire, and an alarm bell is rung, and continues ringing during the period water is flowing through the installation.

From this description will be easily understood the great advantage gained by such a system, which is able to automatically deal with an outbreak in its earliest stages, and is not dependent upon individuals to direct extinguishing operations.

The Wet and Dry Pipe System.

Two forms or systems of installations are now in use—the wet and the dry pipe. In the former the installation is continuously charged with water, and in the event of a fire acts as already described. In the latter the pipes in the buildings are filled with air at sufficient pressure on a valve to hold back the water in the supply pipe. Upon a sprinkler opening, the air escapes and releases the pressure on the valve, which is forced open by the water, which then flows into the installation, and through the open head. This system should only be adopted in buildings which are not artificially heated, and in which there is a possibility of the water in the pipes freezing. In such cases the heads are placed upright and above the pipe line, every pipe having a fall towards the waste or drain pipe, to drain off all water from the installation, the system being also so arranged that not more than 700 sprinklers are controlled by one main stop and air valve. The dry pipe system is largely adopted in Russia, Canada, and other countries having similar climatic conditions.

In some factories, however, it may be desirable to have water in the system for the greater part of the year, and air for such a period as when liable to damage by frost, when it is usually arranged to provide an alternative wet or dry system; this necessitates a slight re-arrangement of the valves.

These are of vital importance. Water must be adequate, both in quantity and

FIG. 15. INTERNATIONAL
(Evans 1902 Model.)

Water Supplies.

pressure, free from fibrous or other matter in suspension, the use of sea water being prohibited.

The approved sources of supply are:—(1) Towns' mains; (2) an elevated gravity tank, or private reservoir; (3) pressure tank; (4) pump; and (5) subject to special approval, an automatic injector apparatus connected with public or other approved hydraulic mains.

An ordinary installation has two separate and adequate sources of supply always available, one at least being practically unlimited and one automatic.

Until recently the only qualification needed for an approved installation of automatic sprinklers was that it should have at least two water supplies conformable to the requirements of the Fire Offices, but in different parts of England it was found that this was not satisfactory, owing to the great difference in the type and quality of those supplies; consequently, standards have recently been arranged which receive the special consideration of the Fire Offices, the water supplies being from two independent sources, both automatic, and always available. These standards are as follows:—

(A) One of the supplies must be from the town's main, or from an elevated private reservoir containing at least 200,000 gallons, and giving a minimum running pressure at the level of the highest sprinkler at all times during day and night of 25 lbs. to the sq. in., when the valve of the waste pipe is fully open, provided the proportionate reduction between the standing and running pressure does not exceed one-half, otherwise a minimum running pressure of 65 lbs. must be maintained at the level of the highest "head."

(B): 1.—As in Standard "A," but with a minimum running pressure at the level of the highest sprinkler of 12 lbs. to the sq. in., when the valve of the waste pipe is fully open, provided the proportionate reduction between the standing and running pressure does not exceed five-eighths, otherwise a minimum running pressure of 40 lbs. must be maintained at the level of the highest "head."

(B): 2.—Neither source of supply being from town's main or elevated private reservoir. The two supplies, however, must be both automatic, and one of them from a practically unlimited source.

In some districts it may be found impracticable to conform to any of the classes previously described. Installations may, therefore, subject to special consideration, be arranged with "one water" supply, which must be automatic and derived from one of the following: (1) Town's main; (2) elevated private reservoir containing at least 50,000 gallons; (3) automatic pump, or (4) subject to special approval, an automatic injector apparatus connected with ublic or approved hydraulic mains.

The following indicate some of the usual methods of arranging the combined supplies:—

	Primary Supply.	*Secondary Supply.*
(1)	"A" Town's main.	Elevated tank.
(2)	"B" Town's main.	Pressure tank.
(3)	"C" Town's main.	Automatic pump.
(4)	"D" Elevated gravity tank or private reservoir.	Non-automatic pump.
(5)	"E" Pressure tank.	Non-automatic pump.
(6)	"F" Two separate town's mains supplied from independent sources.	

Also similar combinations having an automatic injector apparatus as one of the supplies.

(To be concluded.)

PALACE OF PEACE TENDER.—The committee of the Palace of Peace at The Hague have accepted a tender for the foundations and basements of the building at 112,500 florins (£9,375).

NEW STEEL WORKS.—Messrs. John Lysaght, Ltd., the well-known sheet iron and bridge manufacturers, of Newport and Bristol, have decided to erect a steel works and blast furnaces on the estate of Sir Berkely Sheffield, M.P., in North Lincolnshire.

View showing how Reinforced Concrete Columns have withstood Fire.

General View.

A VIENNA FIRE.

The accompanying photographs of a fire in a warehouse at Vienna are remarkable as indicating the effect of fire upon various types of construction and various forms of building material. It is rarely the case that so many types of construction and forms of building material are under the test of actual fire simultaneously, and that also where they have been under test good photographs are to be obtained. In this particular instance there are excellent views of havoc wrought by fire upon unprotected steel. There are remarkable views, also, of how reinforced concrete columns have managed to withstand the effects of a fire that has played havoc with steel, timber and brickwork alike; it will be noted that the reinforced concrete columns in question are round in section, and that they are scarcely spalled. Another view shows how the brickwork has given way in parts in the most remarkable manner, whilst the most extraordinary view is the one showing how the whole brickwork front of the building has been thrown out by the girders.

The views presented are eloquent examples of the necessity for fire prevention, and illustrative also of the advantage of protecting steelwork by concrete, and the use of reinforced concrete for fire-protective work.

View showing Distortion of Unprotected Iron Girders.

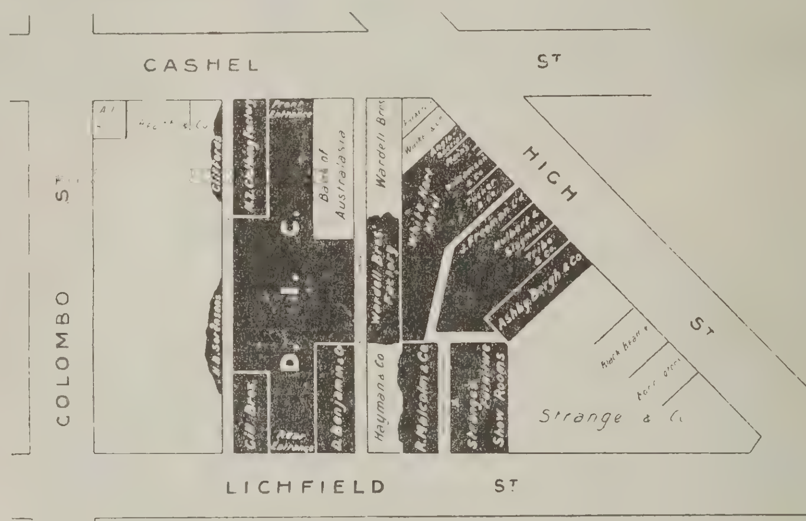
Detail View of Stanchion and Girder.

View looking along Girder showing twist.

FIRE AT A VIENNA WAREHOUSE.

View of the Destroyed Buildings facing Lichfield Street. The fire commenced in the building on the extreme right—Strange & Co.'s warehouse.

FIRE AT CHRISTCHURCH, N.Z.



A cross indicates where the fire started.

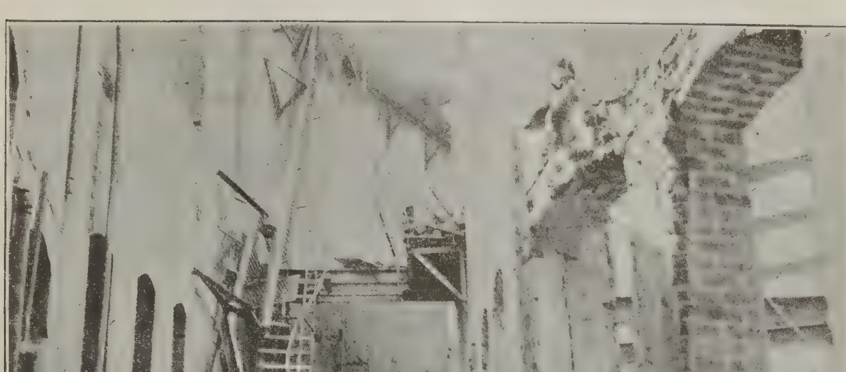
PLAN SHOWING AREA OF FIRE (BUILDINGS DESTROYED INDICATED IN BLACK).

FIRES IN THE COLONIES.

The Fire at Christchurch, N.Z.

Whilst the Metropolis has been safeguarded from great conflagrations during late years by the combined work of fire-preventive measures and excellent fire-brigades, and last, but not least, by the rules as to maximum cubic extent, a very considerable number of fires of a "conflagration" character are still occurring in our Colonies and in the United States.

The latest of these fires, which burnt down an important portion of Boston, U.S.A., does not perhaps present any very interesting features from the technical point of view, as one might have expected, having special regard to the fact that the district in which the fire occurred was mainly a residential one. On the other hand, the recent fire in the business quarters of Christchurch, New Zealand, was of no small importance. We give some views on this page as being characteristic of a fire in a large Colonial city of business pretensions. The views explain themselves. They show the character of the buildings, and the nature of the destruction wrought, while the plan indicates the area affected. A somewhat remarkable view is the one showing the collapse of the front of a wall, the photograph having been taken at the actual moment when the wall was falling into the street. The views are also of interest as indicating the character of the fire risk in structures such as these, and it would certainly appear that an active propaganda in the interests of fire prevention might be taken up in the Colonies just as energetically as it has been taken up at home. Our Colonial readers and perhaps readers here as well, may be interested to know that certain efforts are being made in this direction in New Zealand (which recently also suffered from a severe fire in Wellington); there is, in fact, a fully-organised section of the British Fire Prevention Committee in New Zealand, with its own headquarters at Christchurch, the subscribers being headed by the New Zealand Government. Mr. Parsons, a well-known insurance expert in New Zealand, is the first hon. local secretary to the section.



View showing fire-escape staircase at White Hart Hotel, and part of Freeman's Building.

FIRE AT CHRISTCHURCH, N.Z.

THEATRE PROTECTION AND THE FIRE-RESISTING CURTAIN.

Having dealt very fully, in our previous "Fire Supplement," with the question of fire protection in the theatres of the Metropolis, we do not propose now to go into any further detail in regard to the Drury Lane Theatre fire. We desire to publish, however, the Lord Chamberlain's Rules, which, for want of space, we were obliged to hold over, as these have an important bearing on the question of theatre safety generally.

The Lord Chamberlain's Regulations as to Theatre Safety.

While the London County Council controls the question of theatre safety in the metropolis, it should be remembered that the Lord Chamberlain has very wide powers regarding theatres generally and their safety in particular.

These rules of the Lord Chamberlain are not as generally known as should be deemed advisable, more particularly as they were revised in 1906, while many are still under the impression that the older regulations are still in force.

The regulations cover a multitude of matters that have no bearing on the actual erection and maintenance of buildings, but the clauses which do refer to this question are found in paragraphs 7 to 44, which we reprint herewith.

EXITS AND ENTRANCES

7. All doors and barriers must open outwards, and the management must allow the public to

leave by all exit and entrance doors, which must be thrown open for the use of the audience at the end of the performance.

8. Sufficient gangways, passages, and staircases, for the exit of the audience, must be provided and kept entirely free from chairs or any other obstructions, whether permanent or temporary, and the audience are not permitted either to sit or stand in such gangways.

9. The corridors must not be used as cloak rooms, and no pegs for hanging hats or cloaks shall be allowed therein.

10. All exits from the theatre used by the public must be plainly indicated in 7-inch letters over such exits and placed at a height of at least 6 ft. 9 ins. above the floor level.

11. The words "No Exit" must be clearly printed in 7-inch letters and when and where practicable placed at a height of at least 6 ft. 9 ins. above the floor level over all doors and openings which are in sight of the audience, but which do not lead to Exits.

All doors, except those marked "No Exit" must, if fastened during the time the public are in the theatre, be secured during such time by approved automatic bolts only.

12. All curtains covering doors, or in passages, must be hung so as not to trail on the floor.

13. Each exit door from the auditorium and stage must have a distinct light fitted over it, such light to illuminate the exit notice, and to be maintained throughout the performance.

14. All exit doors must have a notice clearly painted on them indicating the method of opening them.

Fire Appliances and Precautions.

15. An ample water supply, where possible on the high pressure main, with hose and pipes must be available to all parts of the House.

16. The safety curtain fitted in the proscenium opening must be lowered daily in the presence of the audience, about the middle of the performance, so as to ensure the arrangements being in proper working order. There must be a note in all programmes and play bills stating this fact. Any failure in the working of the safety curtain must be communicated at once to the Lord Chamberlain.

17. An inscription of the following nature must be exhibited on the fire-resisting screen—"Safety curtain." The notice must be exhibited in sufficiently large letters that can be read from all parts of the house.

18. Whenever the curtain is lowered, all lights in the auditorium which are not controlled from the stage switchboard, must be lighted.

19. No wires, etc., in connection with gymnastic or other displays, or any other apparatus, must be allowed to interfere in any way with the lowering of the safety curtain.

20. Communication must be established between a point on the stage in close proximity to the releasing gear to the safety curtain and the telephone alarm in connection with the nearest fire brigade station.

21. Wet blankets or rugs, and buckets filled with water must be always kept in the wings and flies and the approaches to dressing rooms; and attention must be directed to them by placards legibly printed or painted, and fixed over them. Some person must be responsible for keeping the blankets, buckets, etc., ready for immediate use.

22. Hatchets, hooks, or other means to cut down hanging scenery in case of fire, must be always in readiness.

The committee of the House of Commons, in their Report on Fires in Theatres in 1877, recommend "with respect to the daily management of the theatre, naked lights should be protected; inflammable materials should not be allowed to be placed where they are likely to catch fire; the hose and other apparatus should be maintained in good order; the passages should be kept clear, and a plan settled beforehand of what should be done in the case of a fire or panic, each of the employees being instructed as to the place he is to take, and the duties he is to perform, and all being occasionally drilled together for the purpose."

23. The regulations as to fire must be always posted in some conspicuous place, so that all persons belonging to the theatre may be acquainted with their contents. A report of any fire, or alarm of fire, however, slight, must be at once sent to the Lord Chamberlain's Office and to the fire brigade.

24. If a temporary proscenium be required it must be formed of non-inflammable material.

25. Where performances are regularly given, and where scenery is used, at least one fireman must be employed during the entertainment. The responsibility as regards the employment of such men must rest, as at present, with the management.

26. Druggets or crumb cloths where used must be secured so as to be in no way liable to rucking, or to be in any way a source of danger to members of the audience.

27. A sufficient number of employees must have definite duties allotted to them in the event of fire or panic, and statements of such duties must be posted up in conspicuous positions. Dry fire drills must be held at least once a week in all theatres.

28. All open fire-places or stoves must be protected by strong fixed iron wire guards and fenders, part of which may be made to open for all necessary purposes.

29. All scenery, wings, sky borders, and cloths, whether on the stage, in the auditorium, or in other parts of the premises, must be rendered and maintained non-inflammable as far as practicable.

FIRE AT CHRISTCHURCH, N.Z.: COLLAPSE OF THE FRONT OF THE "D.I.C." BUILDING IN LICHFIELD STREET.

Lighting.

30. All fixed and ordinary gas burners whether about the stage or other parts of the theatre must be furnished with efficient guards. Movable and occasional lights must be, where possible, protected in the same manner, or put under the charge of persons responsible for lighting, watching, and extinguishing them. The service of light for the auditorium and entrance passages must be separate from that for the stage.

An additional means of lighting for use, in the event of the principal system failing, must be provided in the auditorium, corridors, passages, exits, and staircases, and if oil or candle lamps are used for this purpose, they must be of an approved pattern, properly fixed to an uninflammable base, out of reach of the public as far as practicable.

Such lamps must be kept alight during the whole time the public are in the premises, and no mineral oil must be used in them.

31. The footlights and floats must be protected by wire guards.

32. The rows or lines of gas burners at wings must commence four feet at least from the level of the stage, and must be protected by fixed iron wire guards.

33. All gas taps within reach of the audience must be made secret. All gas pipes must be made of iron or brass. All gas burners must be protected by glass or wire globes.

34. Where there is an electrical installation a properly qualified man must be in charge of such installation.

35. In all cases in which it is desired to instal temporary lighting, notice must be given to the Clerk of the London County Council, in writing, as long as possible before it is desired to commence the work.

Wires and cables must be adequately and firmly fixed, and must be similar to the wires specified in the London County Council's regulations, and in all cases where the wires are within reach of the public they must be cased.

All joints must be soldered and taped if used for more than one week, and if used less than a week the wire must be soldered, if larger than 7/20 S.W.G. or its equivalent. In either case the joints must be taped.

The circuits must be sub-divided as much as possible, no sub-circuit exceeding 10 amperes.

All temporary work must be immediately removed when no longer required for the purpose for which it was installed.

In the case of temporary work on the stage, all connections to the permanent installation must be removed immediately after each performance in which they are used unless permission be obtained to the contrary.

Such special conditions as may be requisite in each case will be attached to the consent of the London County Council to the use of temporary electrical work.

36. All main switches, fuses, etc., which are the property of the electric supply company, must be distinguished by being coloured red with a white band.

37. At least one pair of indiarubber gloves must be provided for the use of the electricians in connection with the electric lighting arrangements as a precaution in the event of high voltage occurring. The gloves must be kept on the stage switchboard and be kept in good order.

38. At least one bucket, filled with dry sand, must be kept in some accessible position on the stage in readiness for use in dealing with an electric fire, and one must also be kept in each of the intake rooms.

Structure, Seating, etc.

39. No structural alterations must be made in the theatre without the sanction of the Lord Chamberlain's Department.

40. Counter-weights, where possible, must be carried to the walls of the buildings. This regulation need not apply to existing theatres, but the ropes attached to the counter-weights must be constantly tested.

41. No decoration, or construction for the purpose of decoration, must be employed in the dressing-rooms which does not adhere without any cavities to the surface of the wall.

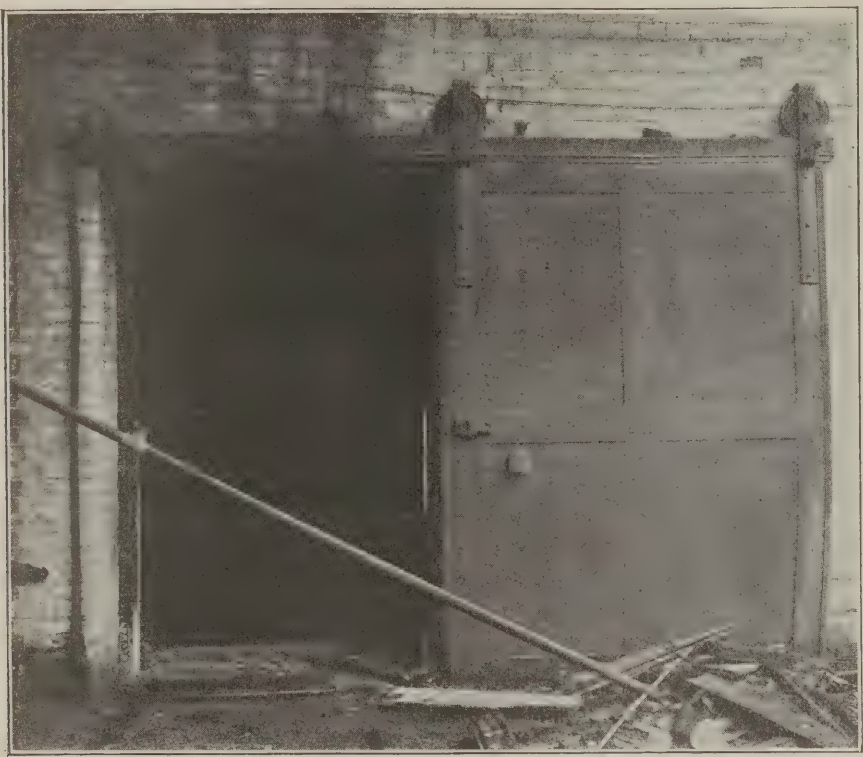
42. The seating area assigned to each person must not be less than 2 ft. deep and 1 ft. 6 ins. wide in all parts of the house where no backs or arms are provided to the seats, and not less than 2 ft. 4 ins. deep by 1 ft. 8 ins. wide where backs or arms are provided. In all cases, however, there must be a space of at least 1 ft. in depth between the front of one seat and the back of the next measured between perpendiculars.

The above regulation shall not apply to the seating now in existence except in cases where it is proposed to re-arrange the seating or to alter the premises.

43. Before any alterations are made in the seating or in the arrangements of the premises, the person or persons in whose name or names the licence is granted must submit full particulars and a plan to the Lord Chamberlain's Department for approval.

44. Where chairs are used they must be battened together at a distance of not less than 1 ft. 8 ins. from centre to centre where they have arms, and 1 ft. 6 ins. where they are without arms and in lengths of not less than four nor more than 12 in a section.

THE SLATE QUARRIES AT BLAENAU FESTINIOG are, mainly owing to the depression in the building trade in Great Britain and on the Continent, largely occupied in making slates that must be stored until the demand for them arises. Other causes for the decline are the competition of French slates, and the increased use of red and yellow tiles consequent on the growing vogue of fourteenth-century design in domestic architecture. It is alleged, however, that the French slates are of inferior durability; and it is confidently anticipated that when the building trade emerges from the present cycle of depression the Festiniog quarries will again flourish.



IRON DOOR AFTER FIRE.

FURTHER TESTS WITH FIRE EXTINGUISHERS.

A further report on fire extinguishers has been issued by the British Fire Prevention Committee (No. 126). This deals with tests made with the "Accurate" extinguisher—that of the Underwriters' Fire Appliances, Ltd., London. The tests were made on fires of drapery, wood, shavings, straw, etc. In a prefatory note to the report, Mr. Percy Collins says:—"The series of tests with the 'Accurate' chemical fire extinguisher again showed that hand chemical fire extinguishers, as a class, can be employed with advantage in the incipient stages of small fires. If a fire has obtained such proportions that it cannot be extinguished by chemical hand fire extinguishers, still they may be useful to keep it in check until larger fire appliances can be brought into play—this applies especially to loose material. It is advisable that chemical first aid appliances be examined and tested periodically, care being taken that the nozzle is always kept clear and the rubber tube in good condition. Hand fire-extinguishing appliances should always be constructed so as to allow of convenient handling."

THE EFFECT OF FIRE ON ARMOURED AND IRON DOORS.

A Comparison.

We reproduce on this page two most interesting photographs showing the relative effects of a fire on an armoured door and an iron door, these views having been kindly put at our disposal by Messrs. The Crittall Manufacturing Co., Ltd., of 11 and 12, Finsbury Square, E.C., who make both kinds of doors.

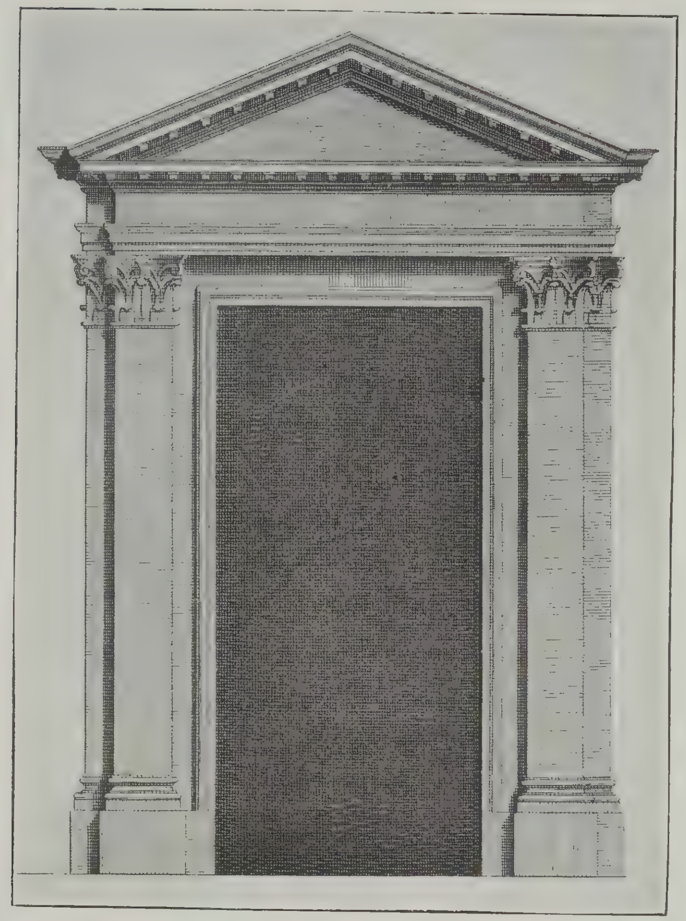
In actual fires, of course, relative results are most difficult to obtain, for the conditions of strain must in some degree be different from official tests. Such tests have invariably shown that the armoured wood door offers a certain fire-resistance for a short period at low temperatures, even when fastened at more than four points; and, similarly, that well-made iron doors, if fastened at six points, are excellent fire-stops—but they must be well made and well fastened.

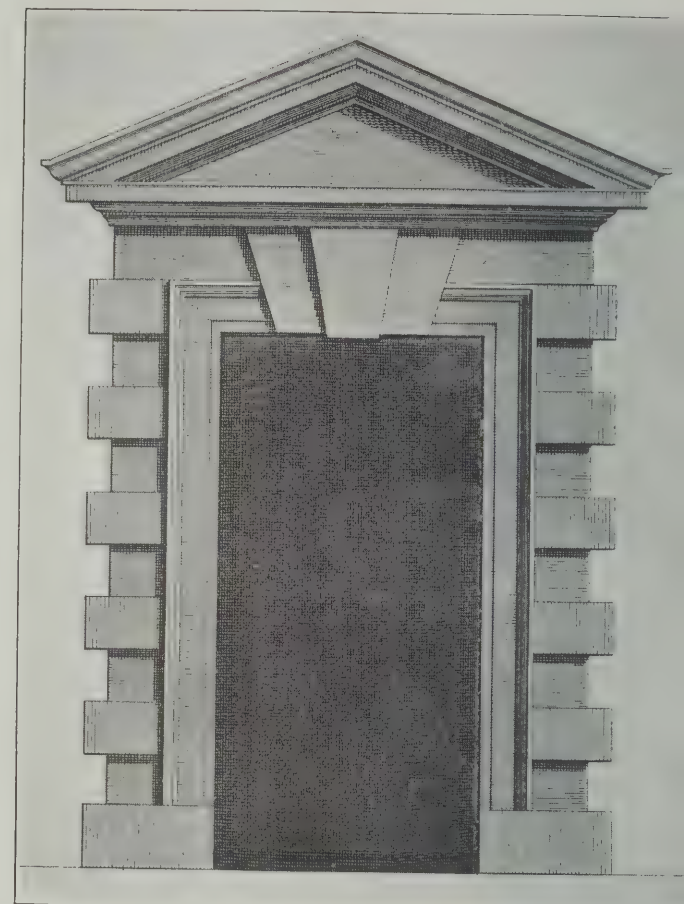
The views we illustrate are from a fire that occurred at Messrs. Eastman's London premises. We are reliably informed that the armoured door was not subjected to nearly the same severity of fire as the iron door. There were several of these iron doors on the ground, first, and second floors, and they effectually prevented the spread of the fire through the party walls. The armoured door illustrated was the only one, we believe, that was subjected to the fire to any serious extent. The result can be seen from the photograph, and tallies almost identically with the results of official tests; that is to say, it shows how the white wood burning inside must have thrown off gases, which, in turn, forced out the metal sheathing, thereby making an opening.

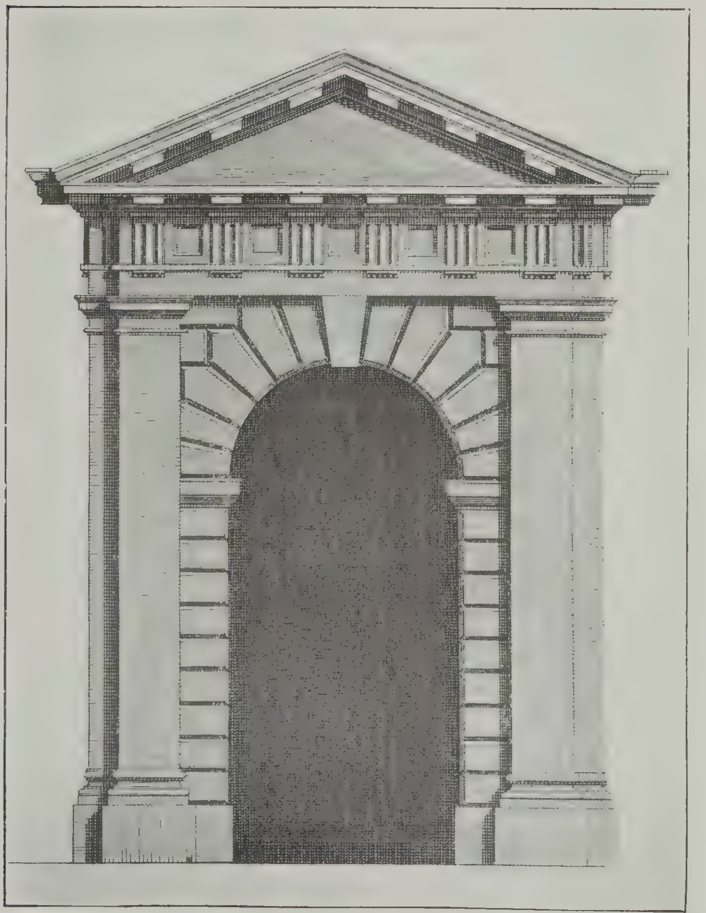
ARMOURED WOOD DOOR AFTER FIRE.

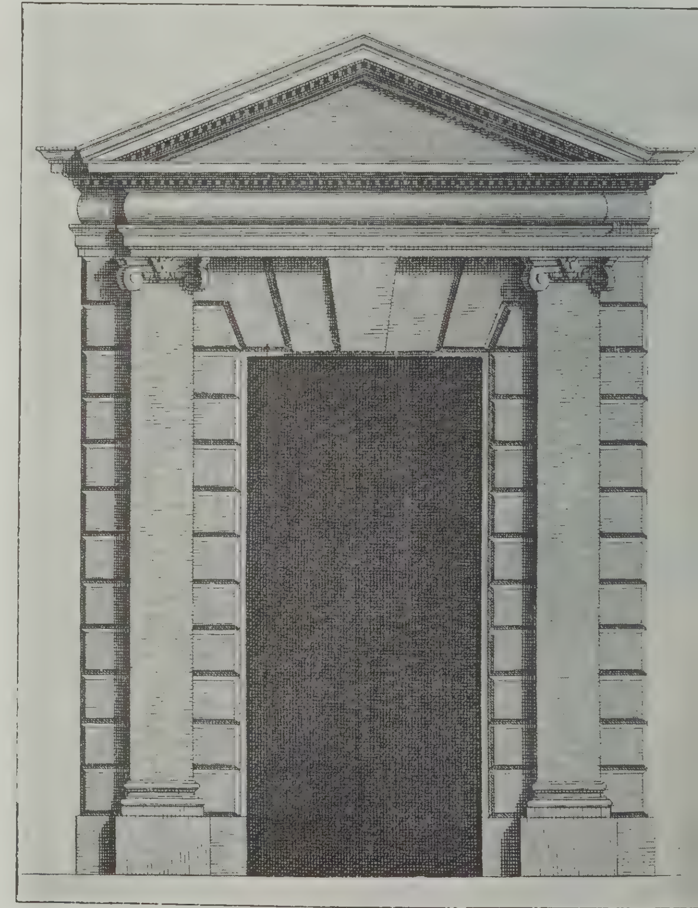
THE GLASGOW MATERNITY AND WOMEN'S HOSPITAL, which has been built and equipped at a cost of £80,000, was formally opened last Wednesday by the Duchess of Montrose. It provides accommodation for 108 patients. The architect, Mr. R. A. Bryden, died two years ago, since when the work has been superintended by Mr. Robertson, of the firm of Messrs. R. A. Bryden and Robertson.

A NEW SUBWAY for foot passengers is to be constructed at the City end of Blackfriars Bridge, which is one of the most dangerous street crossings in London. The plans that have been prepared in accordance with a scheme brought forward by the City Corporation show a subway between the north-west corner of Blackfriars Bridge and Queen Victoria Street, with spurs going east and west—towards the District Railway station and De Keyser's Hotel respectively. The estimated cost is £30,000, which is to be paid by the London County Council, in accordance with the agreement with the Corporation with respect to the widening of the bridge.

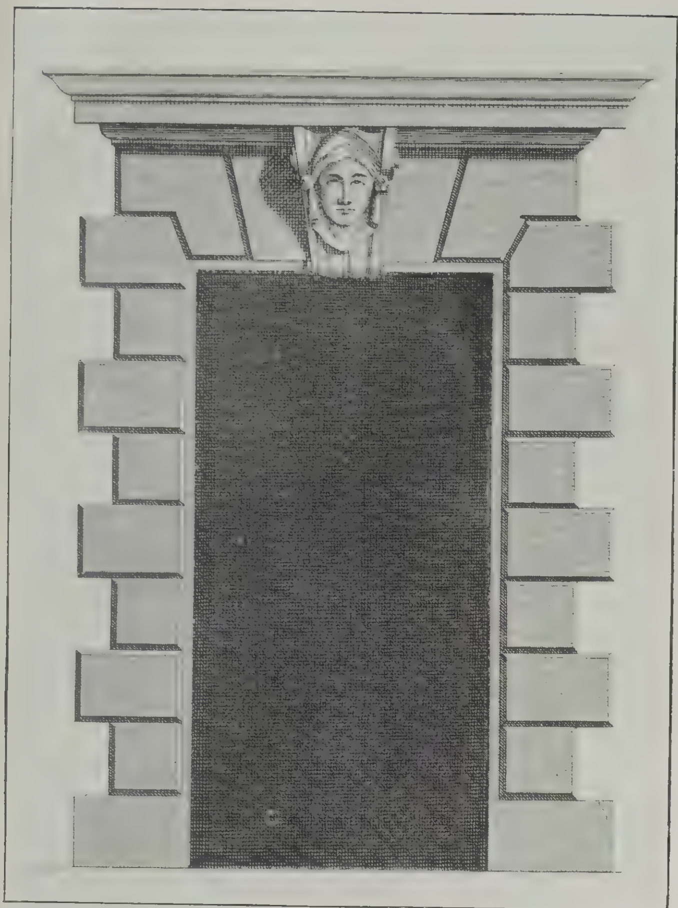


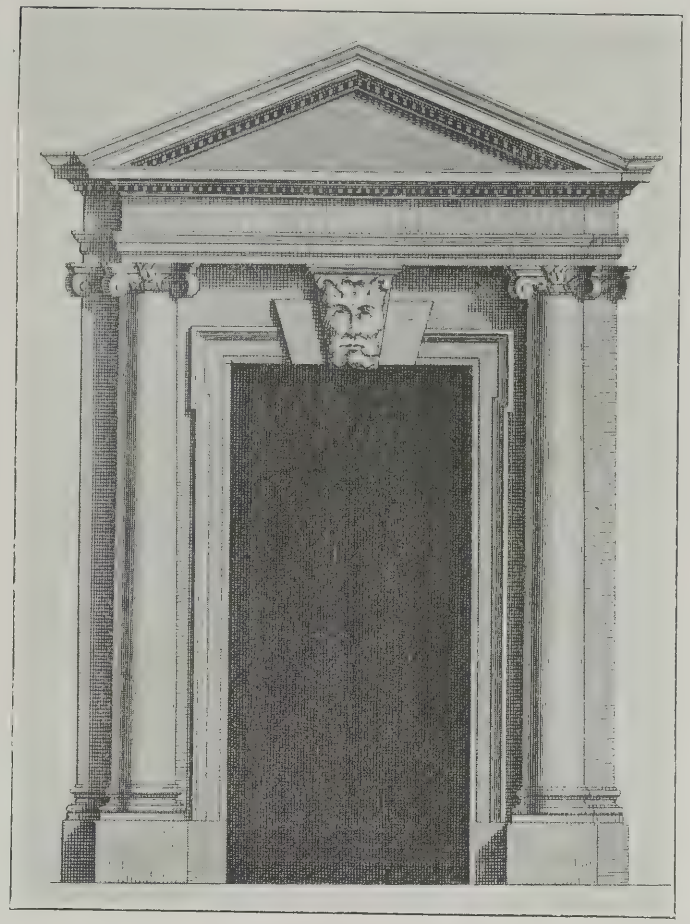


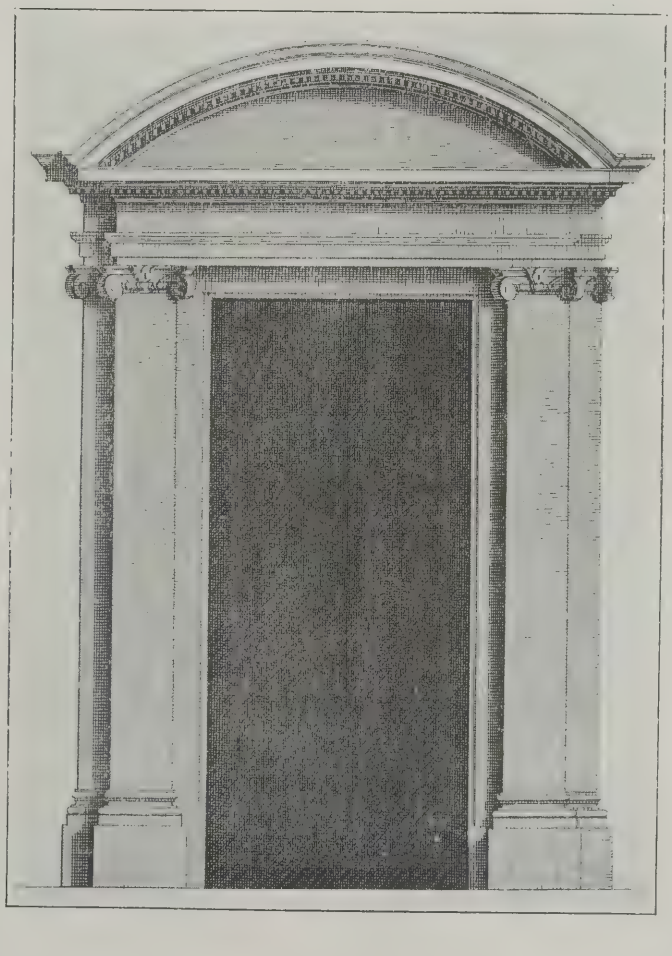




SOME DESIGNS FOR DOO







S. BY JAMES GIBBS.

May 13 1908. Volume 28 No. 692.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

The Proposed Diploma in Architecture. In view of the very exhaustive discussion which arose on the original proposals presented to the Senate of the University of Cambridge on January 30th last, an amended report has now been drawn up by the syndicate appointed to consider the desirability of instituting in the University a diploma in architecture. This amended report is to the effect that whilst the syndicate are not unanimous in their opinion as to the possibility of framing a complete scheme of work, part of which would be post-graduate, leading up to some final scheme which might, or might not, carry with it a diploma, they adhere to their proposal for a preliminary examination—for which, they suggest, an appropriate title would be "Examination in Preliminary Architectural Studies"—in subjects connected with architecture, this examination to be divided into two parts, and held twice a year under the general management of the Board of Examinations. The first part of the examination would deal with the mathematical and scientific principles on which the practice of architecture is based, whilst the second part would comprise the history and theory of architecture and the allied arts. It is suggested that one or both parts of the examination should be open to candidates who have kept three terms, but that a candidate should not offer himself for examination in more than one part in the same term, unless he has previously kept eight terms and has entered on his ninth term at least. In addition, it is proposed that a candidate who has obtained honours, or been allowed the ordinary degree in the Mechanical Science Tripos, or has passed in Parts I. and II. of the special examination in Mechanism and Applied Science, shall be exempt from Part I. of the Examination in Preliminary Architectural Studies. We have already published (see our issue for March 11th last) the original proposals formulated by the Diploma in Architecture Syndicate, and on comparing the two reports it appears that the suggestion originally made to add an examination in architecture to the number of subjects included in the list of "Special" examinations for the ordinary degree has now been abandoned. The present proposal is that the proposed "Examination in Preliminary Architectural Studies" should be one which may be taken during, or at the end of, any of the regular courses leading to graduation, and that it should not entitle to a degree except in the case of those who have taken honours in a part of any tripos examination, or in one section of the Mediæval and Modern Languages Tripos. As an undergraduate who has succeeded in obtaining honours, in his second year, in parts of certain triposes is now entitled to his degree at the end of his third year without further examination, provided he presents a certificate to the effect that he has during the terms still required to be kept (*i.e.*, those subsequent to the term in which he obtained honours) "diligently pursued a course of study in the University," it would be open to students in architecture to qualify for a degree during their third year by attendance on courses connected with the subject of the proposed preliminary examination in architectural studies, and they might take one or both parts of the examination in the course of their third year, but the syndicate propose that no candidate shall be entitled to a certificate that he has passed the examination until he shall have qualified for a degree. As to those students who, from the commencement of their University career, aspire only to the possession of an ordinary degree, the report states that "it might be only the more intelligent or the more energetic of them who could pass both a special examination and the two parts of the architectural examination by the end of their third year, and in their case one or both parts of the architectural examination would be deferred till after the graduation." The architectural profession in general will await with great interest the forthcoming action of the Senate with respect to the amended proposals now put forward.

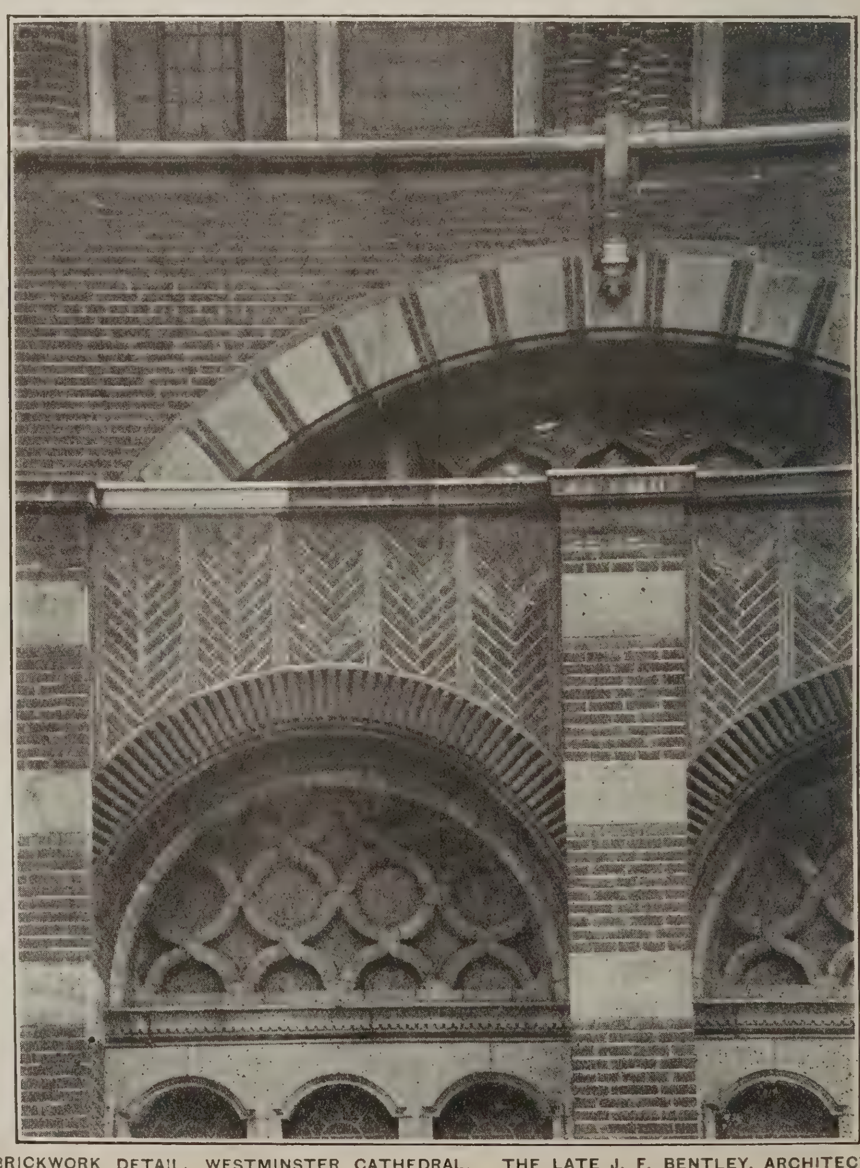
The Value of Old Work. It is gratifying to us to know, by opinions which have been expressed, that the illustrations we have given of old buildings, and designs by architects of scholarship and ability (such as James Gibbs), have been widely appreciated. No doubt they come as a kind of set-off to the heterogeneous collection of modern work which is issued to the profession at regular periods: the bulk of which is, to put it politely, very mediocre. We count ourselves essentially among the "moderns," but we cannot fail to recognise the worth of the great architects of the past, to appreciate the breadth of their treatment, their observance of proportion, and the absence of trivial details in their work—in all of which qualities, unfortunately, modern buildings are singularly deficient. The architect to-day, of course, is confronted with problems which his predecessor did not have to meet, and, as a consequence, he finds himself in a constant difficulty of complying with the necessities of business, habitation, light, and a hundred other matters, while at the same time endeavouring to embody these in good design. Nevertheless, there is clearly a want of ability displayed which does not in any way arise out of the conditions, and it is particularly on this account that we can turn with advantage to the works of great architects of the past. It has been our endeavour, in some small way, to aid architects in this respect by issuing plates of old work as well as of new, many of these being scattered throughout publications of great cost, to be found only in a few libraries, and not easily accessible to the average man.

The Marble for the Queen Victoria Memorial. In connection with the National Memorial to Queen Victoria now being erected in front of Buckingham Palace, it will be remembered that a short time ago a petition was presented to the Government urging that the marble work should be fashioned here by British workmen, instead of by foreigners at the Carrara quarries. Mr. Hay raised a question in relation to this matter in the House of Commons last week, and the Home Secretary has furnished a printed reply to it. In this he says that he regretted being unable to advise his Majesty to take any action in the matter. Briefly restated, the reasons for declining to interfere with the arrangements made by the sculptor (Mr. Brock) are—that the hard Sicilian marble having been chosen as likely to withstand the destructive influences of the London climate, it is expedient to have the stone worked at the quarries of Carrara by men accustomed from boyhood to the peculiarities of a somewhat difficult stone, and, incidentally, to save the expense of importing more than a thousand tons of raw material, much of which would cut to waste, while some of it would have to be rejected on the discovery of flaws revealed as the working proceeded. The Home Secretary points out, however, that the granite for the steps and paving of the

central portion of the memorial, as well as all the surrounding architectural work, are entirely in British hands. It may be noted that a good deal of the business of the 400 or so working quarries of Carrara is controlled by enterprising Britishers and Americans, and that the term "Silician" used in Mr. Gladstone's reply refers to the old practice of shipping Carrara stone via Sicily.

Dry Rot—Its Nature and Cause.

The legal case reported in our issue for last week relative to the condition of several of the buildings, comprising the Sandlebridge Colony for epileptics, near Manchester, is one that may serve to remind architects how little they know of the real nature of that destroyer of timber, the fungus *merulius lacrymans*, popularly known as "dry rot." Its specific name, *lacrymans* ("weeping"), denotes the power possessed by the soft, spongy growth of attracting moisture from the atmosphere (which indeed, under certain conditions, is absorbed to such an extent that it often drips from the fungus) thus materially assisting in rotting the timber, which, in its last and most frequently observed stage of decay, becomes quite dry and friable. From the very useful "Leaflet No. 113," published by the Board of Agriculture and Fisheries, upon the subject, we learn that infection with dry rot occasionally takes place in the forest, when timber which has been felled remains there for some time, and that the first evidence of such infection is indicated by the presence of red stripes in the sawn wood. If such wood is allowed to become thoroughly seasoned, the mycelium present in the red stripes is killed, but when the seasoning is neglected, or imperfectly performed, the mycelium, which possesses the power of remaining in a latent condition for some time, commences active growth directly the timber is used in any part of a building in which it is exposed to the damp, and this, in some cases, is unavoidable; for instance, when the ends of joists or other timbers are built into a wall. But, on the other hand, the fungus often makes its appearance on old beams and boards stored in timber yards, and it is mainly from such sources that spores, or portions of the spreading mycelium, are introduced into buildings by new timber, which has thus become infected. The air of towns always contains spores of the dry rot fungus, because when a house that has suffered from the complaint is under repair, sufficient care is not exercised in the immediate destruction by burning of all diseased wood; and portions that are not already too much decayed are often stored for future use, when repairs are required. During the erection of a building the danger arising from the presence of dry rot may be reduced to a minimum by (1) providing a thorough system of ventilation for all timber used, and by the avoidance of all damp and unventilated places; (2) discarding all immature and imperfectly seasoned wood; (3) by allowing the builder's work to be proceeded with slowly in order to prevent the imprisonment of a super-abundance of moisture within the walls and other portions of the building; (4) by making no attempt to exclude dry rot by the futile plan of hermetically closing all communications with the outer air in the spaces between flooring boards and joists, and similar places; (5) by not allowing floor coverings, such as linoleum, to be used until the boarded floors are in a thoroughly dry state. In addition to the precautions we have enumerated, it is necessary to guard against what is, perhaps, the greatest source of danger, namely, exposing timbers to dampness by building their ends into walls near the basement level, as, for example, in the case of floor joists, the ends of which, when so built in, should *always* be treated with creosote. Coal tar should not be used for this purpose, as its power of penetrating timber is very limited, and it often thus merely forms a waterproof coating, which prevents the timber treated with it from becoming dry. Another frequent cause of trouble arises from the use of damp-deadening material (or pugging), and covering it over with boards before all the moisture it contains has been allowed to evaporate. Any material used for pugging should be as dry as possible, and all boarded surfaces which come in contact with it should be first painted with methylated spirits, containing corrosive sublimate in solution in the proportion of 6 ozs. to 1 gallon. On the evaporation of the methylated spirit a coating of the corrosive sublimate remains on the boarding and completely destroys any mycelium coming in contact with it. As it has been proved that the spores of dry rot can only germinate in moisture containing some alkali in solution, coal-dust, cinders, or any kind of humus should never be used for deadening or packing. The fruit of the dry-rot fungus presents the appearance of irregularly shaped "flattened or undulating patches of variable size, adhering, by their entire under-surface, to the substance on which they are growing." Upon arriving at maturity, the central portion of the patch is covered with an irregular network, formed by slightly raised anastomosing ribs, of a rich brown colour, due to the enormous quantity of spores, which, diffused by currents of air, or by mice and insects, are deposited, in the form of powder, on surrounding objects. The margin of the fruiting patch is surrounded by a snow-white fringe of mycelium, which, supplied with food and moisture from the parent plant growing on wood, spreads in every direction, creeping up walls and passing through crevices and thus extending over stone and other substances not containing food it finally permeates a building from basement to attic. Whenever one migrating mycelium comes in contact with wood, the latter is attacked and a new centre of food supply thus established, from which strands are thrown out in search of other sources of nourishment. Large felt-like sheets of mycelium—white at first, but soon changing to a pale grey— and capable of being readily removed intact, are thus often formed. When the presence of the spreading mycelium is detected, its progress can often be arrested by the ap-



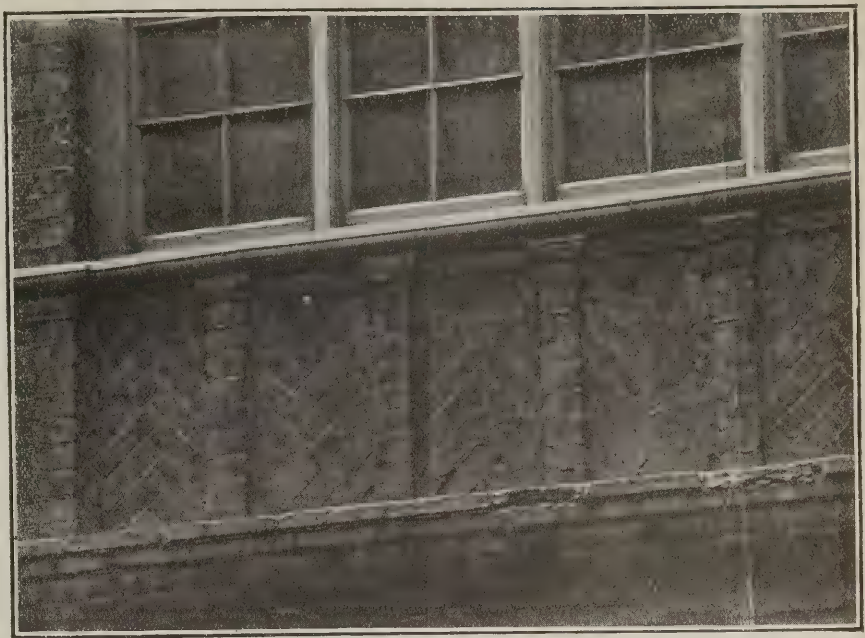
BRICKWORK DETAIL, WESTMINSTER CATHEDRAL. THE LATE J. F. BENTLEY, ARCHITECT.

plication of carbolic acid, and all woodwork in the immediate vicinity of the fungus should be thoroughly saturated with the same substances. The necessity for giving close attention to this subject is emphasised by the recent case to which we have already made reference, where a well-known architect was sued for damages caused by dry-rot.

A Forecast. In a popular contemporary we notice one of those articles on the lady architect which are periodically inflicted on a long-suffering public. This time the exponent of the art is an American lady, Miss Kellogg, who expatiates in an optimistic, if rather vague, way on some of the developments of house building in the future, more particularly the developments that are to take place in New York buildings. Among other matters she observes that the sanitary conditions of New York a hundred years hence will be "a marvel," and we are quite willing to believe this, for Miss Kellogg tells us that "water over the viaduct will pass into the city from different quarters, and the baths of ancient Roman days will return in all the added glory that architectural experience will have taught us." Probably ancient Rome had not the advantage of the feminine point of view, emphasised by practising lady architects, and the dictum of one of Miss Kellogg's great countrymen, "Never prophesy unless you know," does not seem to daunt her. It is so long ago since he said it.

Brickwork Detail. The two examples of brickwork detail here shown are representative of the fecundity of design which is an outstanding feature in all the work of the late Mr. J. F. Bentley. Such detail adds great interest to a building, and architects do not give so much attention to it as the means deserve. Westminster Cathedral is eloquent of the possibilities of brickwork detail. The example here shown occurs on the west front, and, like the rest of the walling, is carried out in narrow red bricks and Portland stone. The bricks forming the window arches were, of course, specially moulded, while the tracery below is terracotta: the whole having an effect of great variety. The other example here illustrated occurs on the front of a printing warehouse in Fetter Lane, and though only a small detail, is interesting for the ingenuity of the treatment.

Italian Realism. Disquisitions on art have to be done very well indeed to be at all tolerable. In the current issue of the "Fortnightly Review" there is a commendably short article that appears to satisfy this test. It bears the rather ominous title "Italian Realism and Art," but its author, M. A. R. Tuker, is but little, if at all, infected with the airy vagueness that seems almost inseparable from æsthetic criticism of the too familiar type. While it may be true that he advances but little that is new, it can be maintained that he re-states fairly familiar truths in a trenchant and an interesting style. He asserts that in architecture, as in every branch of painting, poetry, music and the decorative arts, "if we think of design, composition, execution, in any of these, we shall admit at once that Italy has been par excellence the land of art in modern Europe." The Italians possess in the superlative degree the gifts of perception and facility. They are the typical realists, seeing everything "in the pitiless light of fact." They are endowed, too, with an "intuitive way of gauging and grouping the data of the senses, with the appreciation of technique for its own sake, and with the balance and proportion implied in these things." Whereas "the Italians learn from the outside," the Northern peoples "get from without only what they bring from within," and hence "it is the custom in England to think and judge as though art were a department of ethics." That is why the Italian is a realist, and the Englishman an idealist. These few citations may perhaps serve to indicate that while the article adds but little to knowledge, its directness of expression renders it readable and refreshing. The indebtedness to Italy of British art and architecture is in no danger of being forgotten, but this crisp reminder of the obligation is none the less welcome.



BRICKWORK DETAIL ON PREMISES IN FETTER LANE, LONDON.
THE LATE J. F. BENTLEY, ARCHITECT.

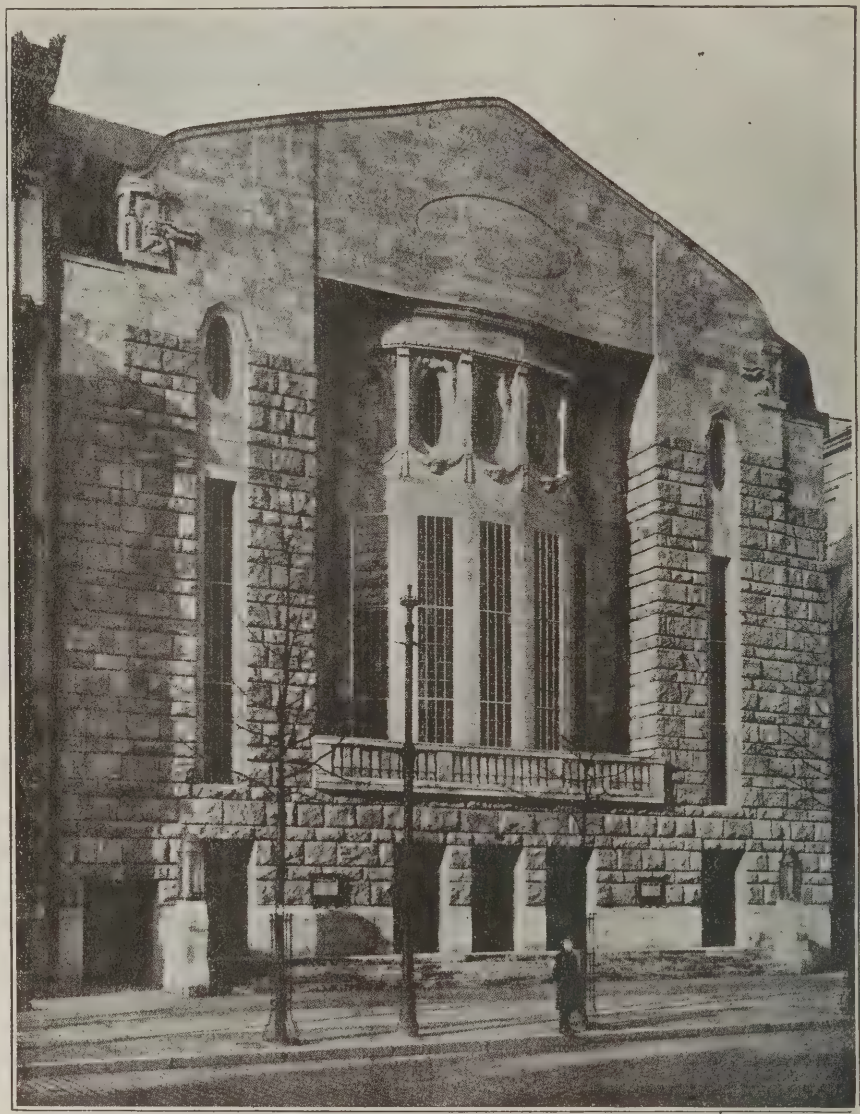
Architects' Registration in Canada. A prescriptive right to the use of the title "architect" was claimed in a Bill that was recently introduced, and decisively defeated, in the Ontario Legislature. The claimants were the Ontario Association of Architects. The Bill that they promoted was put forward as an amendment of an existing Architects' Act, and its supporters were doubtless encouraged in their effort by the precedent that has been established in the States of Illinois, New Jersey, and California, where enactments of somewhat similar character are already in force. A further demand made in the Ontario Bill was to the effect that the Association should be given power to impose certain terms on the University with respect to the examination of architectural students. The precise character of these terms is not evident from the information given in the Canadian architectural journal to which we are indebted for such particulars as are available. What is quite clear, however, is that the University opposed the Bill, "on the ground that the Government had given to them the charge of higher education in Ontario, and that they did not wish any standard to be set up and controlled by persons who were not giving tuition." Evidently the University is standing on its dignity. "An two men ride a horse one must ride behind," and the University politely declines to take the back seat. The University, however, while refusing to become a mere examining body for the Association, is prepared to revise the academic course in architecture, and to bring it up to the standard established by the United States universities. Although we are not directly concerned with the domestic affairs either of Ontario or of the United States, it is perfectly obvious that these adventures and experiences have certain features in common with our own registration and University movements, and must therefore excite some degree of more or less sympathetic interest. The Bill was opposed not only by the University, but also by many architects, who contended that the Legislature was only concerned in protecting the public from faulty construction or imperfect sanitation, and that these objects could be, and were already, effectually secured by the enforcement of by-laws. They further contended that any standard that the Government could establish requiring that a man should be qualified in construction and sanitation would not make him an architect. It is understood that the disagreement between the University and the Association is purely academical, and that a mutually satisfactory arrangement is by no means beyond hope.

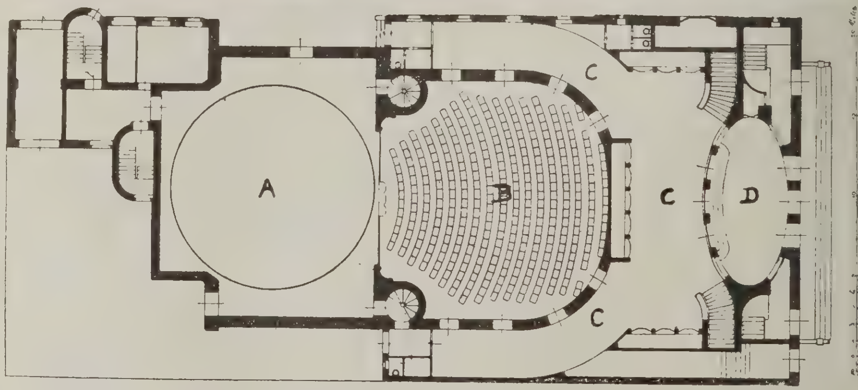
Strong Language about Mural Tablets. We are not accustomed to expect anything very lively at the meetings of archæological societies; consequently, what was said by the Rev. J. F. Hodson, vicar of Witton-le-Wear, at the annual meeting of the Archæological and Architectural Society of Durham and Northumberland, held at Durham last Thursday, came as shock to us, though we are quite in accord with the tenour of the remarks made. Mr. Hodson said there was one point which he felt very acutely about as an ecclesiologist and a life-long student of church architec-

ture, and that was the popular devilment that seemed to have taken place among clergy and people all over the country like a pestilence. He could not take up a daily paper without seeing that the walls of cathedrals or metropolitan churches had been defaced by the most horrible and, he must say, damnable tablets. There was hardly a portion of most of their churches which had not had its walls defaced by tablets. He would say nothing of crosses like those in the cathedral churchyards, where names were printed in brass or marble-edged tablets, but anything more destructive to the repose and quiet dignity of the sacred edifices than abominable tablets plastered like blisters and blackheads over the walls of the churches could not be conceived. He would like the influence of their society, as far as possible, to be brought to bear to prevent these horrors being plastered over the church walls. He believed they were even worse than the stained-glass windows!

A New Berlin Theatre

We give an illustration on this page of the new Hebbel Theatre recently completely in the Königgrätzer Strasse, Berlin, from the designs of Oskar Kaufmann. This serves as an example of a class of work which is very much favoured in Germany just now. From other illustrations which have appeared in various journals our readers will be familiar with the phase of "Art Nouveau" expressed in buildings —a reckless, formless, hopeless type of work whose contortions would appear to resemble those of a worm swallowing a bone. The theatre here illustrated, it will at once be seen, does not come within that category. It is the work of an architect who clearly has some consideration for precedent. But, frankly, we cannot admire it. One recognises the value of the unbroken wall space in the upper portion, and the strength of the rough stonework below; but let this design be examined in detail, and it will be seen how essentially wrong are the principles upon which it is based—principles, unfortunately, which have gained a large currency. The main wall surface is out of all scale to the work, the cyclopæan blocks being absurd in conjunction with the fine stonework used for the base of the building, for the central bay, and for the gable. Then, again, look at the coarseness displayed in the balustrade over the entrance doorways. Who, with any sort of knowledge and appreciation of good work, can warrant such gross design, and how is it possible when associated with the fine carved detail in the oval windows above? The one does not set off the other: the two things are wholly incongruous. Again, what is the swelling in the gable but another eccentricity, and how can the giant heads on either side be tolerated? It is the same throughout the building. We are quite prepared to admit that even "Art Nouveau" has some merits, perhaps the chief of which are the fine sense of colour and the freshness in detail shown in the work of some of its ablest exponents. But we think these merits are swamped by the wild extravagance which is the main characteristic of "Art Nouveau." The effort to be original at any cost is too painfully apparent, and the result, consequently, is an offending failure. In the less aggressive work we are apt to be led away from essentials by the glamour of novelty, but, as we see in this new theatre, the same wrong principles are at the root of the mischief.





Ground-floor Plan- A, Stage; B, Auditorium; C C C, Promenade; D, Entrance Hall.

AN EXAMPLE OF "NEW ARCHITECTURE" IN BERLIN: THE HEBBEL THEATRE IN THE KONIGGRATZER STRASSE. OSKAR KAUFMANN, ARCHITECT.

The Franco-British Exhibition Buildings.

The Franco-British Exhibition, to be opened this week at Shepherd's Bush, is a modern example of rapid construction in substantial materials. The regulations of the London County Council prohibit the use of wooden structures, as such would be most dangerous in an undertaking of such magnitude. The buildings, therefore, are constructed with a steel and iron framework, encased with concrete and white plaster. The type of concrete blocks, of Portland cement and breeze (1 to 4), with which the framework is covered was experimented upon for twelve months by the Council before being approved, and all the necessary tests for strength, weather-resistance and fire-resistance were made to ensure sound construction. About 75,000 tons of steel-work have been used in the buildings, while the cost of concrete in walls and floors is given as £100,000. For concrete making, 1,000 loads of ballast have been required. The whole of the site had, of course, first to be prepared, and drains

laid—itself a very large undertaking in an exhibition which comprises 136 acres. Gas and water mains also had to be laid, as well as electric light and power cables. Thirty miles of drains have been laid, 20 miles of water pipes, and 4½ miles of gas pipes; and to the water supply must be added the Venetian canal, one mile long, which winds through the grounds, and also the large swimming and diving pond in the stadium. At present there are about 7,000 workmen busily engaged in completing the work, though we do not see how the whole can possibly be completed by the opening day, May 14th. So far as we are able to judge at present, the Exhibition looks as though it would be a huge success. Architects should not fail to see it, on account of the buildings, some details and photographs of which we hope to publish soon.

For Subscribers. For the convenience of our subscribers we have brought together in our new offices at Caxton House, Westminster, a collection of books on the many branches of building construction, which are now catalogued ready for reference. All the standard books are included in the collection, and it is our intention to add new books immediately they are published. Subscribers will thus have at their disposal a library of all the latest books on construction: and this, we think, will be found of considerable service, especially in the case of expensive books. In construction, more than in any other phase of building art, it is imperative to keep abreast of the times, because new methods are constantly succeeding old methods, and, as a consequence, what was regarded as good practice a few years ago is often now regarded as antiquated. Books are very largely a reflex of contemporary life and work—indeed, as regards building construction, it is frequently the case that they are rather behind the times than abreast of them—and so it becomes imperative to have the latest editions for reference. Such editions will be found in our library, and we feel sure the advantage of thus being able to refer to them, without charge, will be greatly appreciated by our subscribers, especially those in the provinces, who can also use the library room for appointments which they may wish to make when in London.

Road Tarring. Some points of interest with reference to motor traffic and the tarring of roads were brought out at last week's meeting of the Herts County Council. The Highways Committee reported on experiments that had been made last summer on the main roads of the county. They found that tarring preserved the roads in more ways than one. It prevented the tyres of motor-cars from loosening the stones, and sucking out the binder between. The ploughing-up of the roads was also stopped, and another good effect was that the roads remained hard, even in winter, through the subsoil being kept dry. From the report of the surveyor it appeared that one coating of tar would last as long as a coating of granite on roads much used by motor-cars. Besides reducing the cost of maintenance, tarring main roads had also the effect of remedying the dust nuisance. On this report the Council decided to tar another fifty miles of roads at a cost not exceeding £40 a mile.

Iona Cathedral Again. We are heartily in agreement with Mr. Arthur C. Champneys in his comments on what has been done in the "restoration" of the ruins of Iona Cathedral, and we are glad to see THE ARCHITECTURAL REVIEW supporting the protest against the project, now on foot, for what is no other than the rebuilding of the nave. An appeal for funds to carry out that object is now being made, but we sincerely trust that they will not be forthcoming, for, as our monthly contemporary says: "What are the facts? The winter population of Iona is a mere handful, and their devotional needs are more than met by the churches that existed before even the choir and transepts of the cathedral were re-roofed, and much extra seating accommodation thereby provided. The summer population consists of natives, plus a few visitors who stay in Iona a few days and nights, and the thousands of visitors who arrive by steamer, and when they have gazed round the old buildings and the tombs of the Scottish kings, incontinently depart. Is it seriously meant that the devotional needs of the Transatlantic ladies in brown veils who honour St. Columba for about three hours demand that this unique sanctuary shall be made ridiculous by the addition of a new nave? The nave is not a building out of repair and needing but repair to make it fit for Divine worship. It is a ruin. It is, as Dr. Mackie aptly says in a phrase we admire, '*débris* and clinging pieces.' We have nothing but respectful admiration for the national and religious feeling which dictates this new suggestion, but on every ground the scheme is preposterous and useless."

THE EFFECT OF FIRE ON ARMOURED AND IRON DOORS.

A Correction.

With reference to the illustrations of an iron door and an armoured door given in our issue for last week, in connection with a fire which occurred recently at Messrs. Eastman and Son's dye works at Acton, we desire to make a correction. We are assured that the armoured door illustrated in our columns was open at the time of the fire, and was really smashed by a falling girder, instead of its plates having been blown off, as stated, by gases generated inside through the consumption of the wood core. The opening in the party wall was protected by two armoured doors—one on each side—and the second door automatically closed and effectually prevented the spread of the fire, and, as we see from a photograph before us at the time of writing, remained with its plates intact. This is confirmed by Messrs. Eastman and Son, who, in a letter to Messrs. Mather and Platt, Ltd., the makers of the doors in question, state that "the armoured doors answered well in the severe fire which has lately destroyed a section of our works; they stayed the progress of the flames at the party wall, and we are well satisfied with their behaviour." The illustration and statements published in our columns were given in good faith, though, in the light of these additional facts, the inference that the armoured wood door failed to stop the fire is incorrect. We regret that any such inference should have been made, and trust that the reputation of Messrs. Mather and Platt's armoured doors will not suffer any injury thereby.

SCOTTISH BUILDING TRADES' FEDERATION.

The half-yearly meeting of the Executive of the Scottish Building Trades' Federation was held at Edinburgh on Friday afternoon last, May 8th. Mr. James Leslie, vice-president, Aberdeen, presided, in the absence of the president, Mr. Alexander Nicoll, of Dundee, who had been obliged to resign his office on the ground of ill-health.

Reports on the state of trade were submitted from Dundee, Oban, Paisley, Aberdeen, Inverness, Kilmarnock, Glasgow, Edinburgh, and Leith. Without exception these indicated a depressed condition of affairs, with poor prospects of any improvement.

It was reported that the operative bricklayers in Edinburgh and Leith were on strike. The employers had given notice of a reduction in wages, while the operatives demanded an increase of ½d. per hour (9½ to 10d.) No settlement having been arrived at at a conference held to consider matters, arbitration had to be resorted to, as provided for under the agreement. The operatives nominated Councillor Mallinson, of Edinburgh, as arbiter, and to his nomination the employers agreed. He could not, however, fix a date suitable for both parties, and ultimately withdrew from the business, for reasons not explained. The employers then nominated either Mr. Oldrieve, of H.M. Office of Works, or the Lord Provost as arbiter. The men, however, refused both these nominees, and said they would not now agree to arbitration, and they came out on strike on May 1st, and are still out. The employers hold that the operatives have broken faith with them, and are still open to settle the dispute by arbitration.

The scaffolding regulations recommended by the committee appointed by the Home Secretary were under consideration, and at a meeting held later in the evening a series of amendments on the proposed regulations, to make them applicable to the Scotch system of scaffolding, were drawn up for submission to the Home Secretary.

On the invitation of the Aberdeen Master Builders' Federation, it was agreed to hold the annual meeting in Aberdeen in September.

THE ARCHITECTS' BENEVOLENT SOCIETY.—In aid of the funds of the Architects' Benevolent Society, the T-Square Club are organizing a concert to be held at the Holborn Restaurant on Wednesday, June 3rd. The presidents and councils of the Royal Institute of British Architects, the Architectural Association, and the Society of Architects have accorded their patronage to the project, and among other distinguished patrons are the past and present Commissioners of His Majesty's Office of Works (the Earl of Plymouth and Mr. Lewis Harcourt, M.P.), Mr. Akers Douglas, M.P., and Sir Schomberg K. McDonell. A musical and dramatic entertainment will be given. Tickets, price 5s. and 2s. 6d., may be obtained from the librarian of the R.I.B.A., the secretary of the Architectural Association, the Society of Architects, and from W. J. H. Leverton, 10, Lancaster Place, Strand, who is arranging the concert. A dinner is to take place the same evening at 6.30; tickets 4s.

THE LONDON COUNTY HALL COMPETITION REVIVIFIED.

Some Breezy Comments.

We have received from Mr. Alex. Koch, of 58, Theobalds Road, W.C., a copy of the special number of "British Competitions" dealing with the designs submitted in the final competition for the London County Hall. The designs are reproduced very completely, plans, elevations, sections, and the ½-in. detail of each design being given, together with a perspective—all to a large scale, the size of the page being practically 20ins. by 15ins. The designs, moreover, are reproduced in line, which achievement on the part of the photographer and the block-maker deserves acknowledgment, we think, in view of the heavy wash and the strong colours on many of the originals. The designs submitted by the eight invited architects and the fifteen competitors successful in the preliminary competition are reproduced, and to these are added (though we cannot see why) six other designs, submitted respectively by Mr. Stanley Hamp, Mr. R. Allsebrooke Hinds and M. Jules de Perthes, Messrs. A. and W. Reid and East, Messrs. Treadwell and Martin, Mr. Harold A. Woodington, and Mr. Koch and Mr. J. Herbert Belfrage, which add to the bulk, if they do not greatly enhance the interest of the book; and to wind up the whole collection Mr. Koch gives his competition design for the Palais de Justice at Sofia. The occasion, however, does not call for any further comment on our part as to the respective merits of the designs, and, having announced the publication of this volume, there remains for us to say that it is being issued in four separate editions, namely: An *Edition de Luxe* on heavy art paper with stiff binding, gilt top (150 copies), price 30s.; a "Library Edition," on heavy ordinary paper, stiff binding, gilt top (150 copies), price 25s.; an "Ordinary Edition," bound in half stiff cover, price 20s.; and a "Students' Edition," on lighter ordinary paper and with less elaborate binding, price 10s.

The book is prefaced by the "Instructions to Competing Architects," the "Replies to Competing Architects," and the unreasonably brief "Report of the Assessors"; after which come two pages of "Comments," written in an extremely racy and well-informed manner. These "Comments" form what we may term a final coherent attack on the way in which the competition was conducted and on the design ultimately selected, and as the matter is still fresh in the minds of our readers, we think it of interest to give the following abstract of the remarks in question:—

Mr. Riley's Perspective and Plan.

"One of the first stipulations concerning assessors abroad is:—No assessor may be connected with the planning or carrying out of the building in question in any way whatsoever, either before or after the competition.

"This rule was not adhered to in the case of the Superintending Architect of the London County Council connected with this competition, and the disastrous effect can easily be shown.

"Some time before the opening of the competition there appeared in different journals and magazines reproductions of a design from the Superintending Architect. And with the conditions a plan was given out, emanating from the same source. . .

"As the conditions were, in many ways, very vague, it is clear that competitors turned for further information to these two documents. Two points only need be mentioned which have influenced the competitors to a very large extent, and, as it ultimately turns out, greatly to their disadvantage.

"In the perspective view Mr. Riley shows the building with an immense central cupola, two smaller cupolas, and five gables with large figure groups on the top, towards the Thames Embankment; therefore, naturally, the majority of the competitors were under the impression that a representative building with such features was required, and very few competitors have discarded them. But, judging from the award, they did great harm to the designers, and it is quite certain that had it been pointed out that such a plain building as the premiated design was desired, all the competitors would have restrained themselves, and a much better result would have been forthcoming.

"Concerning the plan, it is true that in the conditions no grand staircase was demanded, only a principal staircase, nevertheless a principal staircase might mean a grand staircase, and in the suggested plan attached to the conditions such a grand staircase is decidedly proposed; therefore all the competitors, except the successful one, supplied the house with a grand staircase. . .

Where should the Principal Entrance be?

"A further point for which the suggested plan is responsible is that most of the competitors put the principal entrance to the building in Belvedere Road, which is certainly wrong, in spite of the award. The principal entrance must be from the Westminster Bridge approach, as this is the frontage of the house reached first by every one who wants to go in. . .

"To put the principal entrance, and especially the carriage entrance, in Belvedere Road, without supplying ample space for a carriage drive as well as a cab or motor stand, is simply to evade the difficulty instead of solving it.

The Large Scale Demanded and the Levels.

"It was nothing less than cruel to maintain the large scale for the plans, in spite of the protests all round. This large scale entailed such an immense amount of simple manual work that very little time was left for real study of the plans by a man who had also to attend to his regular work. Had the scale been half the size, or even smaller, it would have been easier to grasp the subject, and many a competitor would have remodelled his plans after they had been half finished had there been any chance of getting through the work. . . .

"It might also be mentioned that the plan of the site issued to intending competitors omitted to give the necessary levels in Belvedere Road and in Westminster Bridge approach, without which no competitor could start his work. Instead of receiving these levels as a supplement, the competitors were asked to buy two plans from Messrs. Stanford and Co. for 2s. 6d. each, which could be of no earthly use to any competitor after this competition.

"Another want of consideration is shown in the fact that no elaborate report was forthcoming, telling the unsuccessful competitors in what points they had failed. . . .

What the Second Competition Achieved.

"Now referring to the report, another mistake in this competition might be pointed out. There were to be two competitions, which was very commendable, but to invite eight architects and pay them to hand in their designs only in the second competition was certainly a mistake, and the second competition did not produce the good which it might have done. Ninety-eight competitors entered for the first competition, in addition to the eight invited beforehand. From this two things resulted:—First it did away entirely with the anonymity of the competitors, on which much stress was laid in the conditions. . . . And, secondly, a lot of unnecessary work was thrust upon the successful men in the first competition; unnecessary, because it is quite clear that the two assessors already, in the first competition, chose the design to which they intended to give the final award, and the fourteen others had to make additional drawings without the slightest chance of these helping them to obtain it. . . .

The Important Question of Accommodation.

"Having enumerated all these mistakes, which have been made in this competition, there remains the last very serious one. This refers to the conditions, or rather to the programme, enumerating the entire accommodation desired in the building.

"The first thing that any architect does upon entering for a competition is to look out in the programme what principal rooms are wanted, so that he may place them where they may find expression in the elevations. . . . But while, so to say, every little corner required for a broomstick was enumerated in the programme, the representative rooms were put under one head:—'Suitable accommodation, amounting in the aggregate to an area of 16,000 sq. ft., for the general use of the members.' Furthermore they asked for a library near the council chamber, but what importance this library was to have was not said; and its extent not given.

"In the answers to questions it turned out finally that a dining-room to seat 500 was wanted for the staff, which would be an apartment much larger than the council chamber, and from this the competitors had to ascertain that the restaurant for the members which had to be provided, and for which no details were given, would not have to be of much smaller size. Even if this restaurant had only to accommodate all the members (200) it would naturally have to be much larger than the council chamber.

"The members' terrace which appears in all the designs is not even mentioned in the programme, and was only taken by all the competitors from the suggested design of the Council's Architect. It was certainly wanted in connection with the restaurant, and not, as in the premiated design, in connection with the library and reading room.

"All these principal requirements were in a great degree left to the discretion of the competitors, which was exceedingly wrong. . . ."

A Letter to the Council.

Here follows a detailed criticism of Mr. Ralph Knott's selected design, and a letter which Mr. Koch addressed to the members of the London County Council. In this letter Mr. Koch criticises the design adversely and urges that "You should instruct the chosen architect, when remodelling his plans, not to make cheapness the first consideration, but submit new plans to you, showing a building with a great representative

entrance from Westminster Bridge approach, with forecourt or courtyard, with an entrance vestibule from which a grand staircase starts, in proportion to the size of the whole structure, ending in another vestibule, or ante-chamber, to the hall in front of the council chamber; this hall to be connected with members' restaurant and terrace, so that all these rooms *en suite* would give, not only the members much comfort and good freedom of movement, but could also be used for various functions"; there being also required a better shape for the council chamber and assembly hall, a better arrangement of the lobbies, lighter corridors and larger courtyards, more liberality in the elevations, a more imposing skyline, and a cupola over the council chamber; and finally Mr. Koch urges that the chosen architect should be relieved of all officialdom, with discretionary powers, "in order that he may select his collaborators or partners if he thinks fit, with the liberty necessary for such important work."

Notes on Competitions.

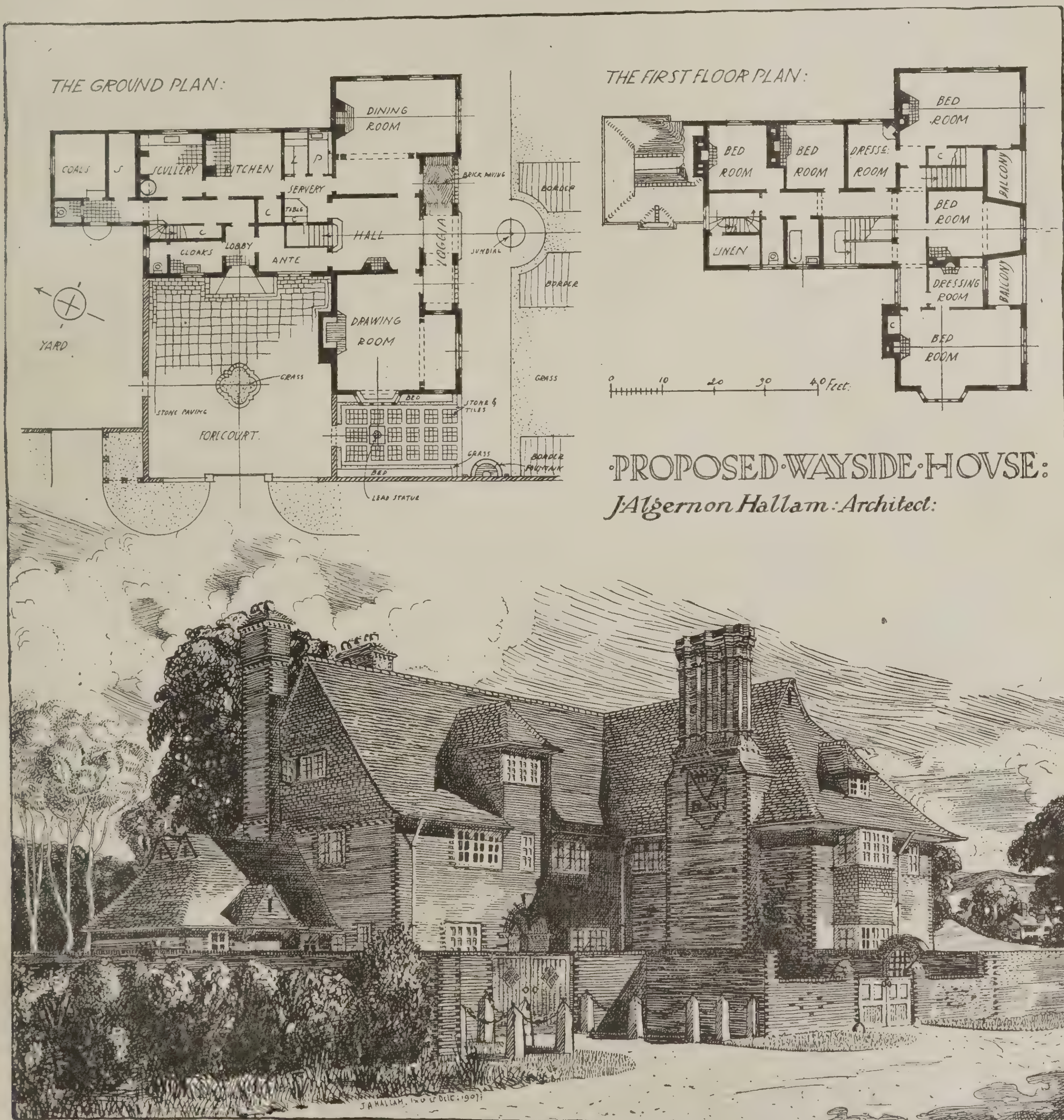
High School for Girls, Stockport.

To the list of awards in this competition published in our issue for last week, we should add that the third premium was awarded to Messrs. Appleyard and Quiggin, A.R.I.B.A., of Liverpool, and the fourth premium to Mr. G. H. Brady, of Stockport.

Intermediate School for Boys, Cardiff.

Writing to the "Western Mail" in reference to the competition for a new intermediate school for boys at Cardiff, for which 37 designs have been submitted, "An Architect" says:—"I give below a comparison of the proper way of conducting a competition as laid down by the Royal Institute of British Architects, and the way the committee went to work:—

How the Competition should have been conducted.	*How it has been conducted.*
The first step should have been the appointment of a professional assessor, whose appointment should have been published in the original advertisements and instructions. The second step should have been the drawing up of the particulars, conditions, and suggestions as instructions to competitors by the professional assessor in consultation with the committee, and the professional assessor in particular to advise the committee on the question of cost.	No professional assessor was appointed until some considerable time after the designs had been received, and the committee refused to give the name of the assessor. The conditions and instructions were drawn up by the committee themselves, no assessor having been appointed, with the result that the committee fixed £10.000 as the limit, and asked for accommodation which would cost £12,000.



This house was planned for a site bounded on one side by a road. The object has been to get only office windows looking on to the road, the private rooms overlooking the garden. The plan shows a hall centrally placed, with the staircase leading out of it, in axial line with a glazed door that opens on to the brick-paved loggia: this loggia has brick piers and arches on the ground floor: the balconies over, on the first floor, have wooden balustrades, and can be used as open-air sleeping places for the two best bedrooms, the main roof of the house sheltering them. The bricks for the walling are intended to be of a dull plum colour, with dark headers, not pointed: woodwork to be painted white, and the roof laid with dark blue-brown tiles.

"Two of the conditions of competition read as follows:—'Designs will be disqualified:—If they do not provide substantially the accommodation asked for. If the assessor (Mr. Leonard Stokes, F.R.I.B.A.) should decide that the probable cost of the buildings included in the estimate under paragraph 11 will exceed the limit mentioned.' The natural result of this municipal method of conducting a competition is that when the assessor comes to judge the designs he apparently finds that none of them can be carried out for £10,000. Anyone would think that his only course in view of the above conditions was to disqualify the lot, but he has thought otherwise, and recommended a design (No. 12) the cost of which to carry out the author himself puts down at over £12,000. If the council adopt this recommendation, an act of great injustice will be done to all the other competitors, many of whom have adopted all sorts of economies to keep the cost at £10,000, and who could, of course, have produced much better designs had they been allowed to spend £12,000." The assessor's award will come before the next meeting of the Cardiff City Council.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.		COMPETITION.
May	14	SCHOOL AT KINGSDOWN, BRISTOL (to accommodate 500 children).—Limited to local architects. Particulars from W. A. Adams, Secretary, Education Committee, Guildhall, Bristol.
May	15	SEWERAGE SCHEME FOR TUAM.—£50 offered for best plans, with estimate. Particulars from J. P. McDonogh, clerk to the Rural District Council, Tuam, co. Galway.
May	16	TECHNICAL INSTITUTE, COLCHESTER.—Architects desirous of competing to submit names by this date. Fifteen will be selected. Premiums, 30, 20 and 10 guineas. Particulars from G. C. Holland, Secretary, Higher Education Committee, 4, Trinity Street, Colchester.
May	19	NEW PARISH COUNCIL CHAMBERS, Motherwell (to cost £3,000). Premiums, £20, £10, and £5. Commission 3½ per cent. Conditions from Alex. Bryden, Parish Council Offices, Motherwell, N.B.
May	20	SCHOOL AT BRIDLINGTON.—Limited to local architects. No premium. Particulars from G. G. O. Sutcliffe. Quay Road, Bridlington.
May	23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May	30	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall, Eccles, Lancs.
May	31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June	1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
June	6	SECONDARY DAY SCHOOL SHREWSBURY (70 Boys and 70 Girls).—Conditions from W. H. Pendlebury, Secretary, Higher Education Committee, Shire Hall, Shrewsbury.
Sept.	15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Particulars in BUILDERS' JOURNAL, April 29th. Conditions from the Secrétariat de l'Association du Monument de la Réformation. 56, Rue du Stand, Geneva.
1909. Jan.	1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date: final competition to be limited to six competitors.
No. date.		COUNCIL SCHOOLS AT NANTWICH.—Particulars from C. E. Speakman, Clerk, Education Offices, Crewe.

Law Cases.

FIRE PRECAUTIONS NEUTRALISED.—At Clerkenwell Police-court, Messrs. F. Gruneiser and Co., of Cross Street, Islington, were summoned last week for failing to keep the means of escape from fire in their factory free from obstruction. Mr. C. F. Wright said that he and an assistant inspector visited the premises in question under the Factory Acts. The defendants were bookbinders, and the officials found that while proper appliances were provided and arrangements made by way of provision against possible outbreak of fire, there were serious obstructions in the way, such as heavy packages, not easily removable, blocking the exits. More than 40 people were employed on the works. This, Mr. Wright said, was the first prosecution of the kind, but the defendants had been previously warned, as had other employers, and the Home Office felt the matter so serious that they took these proceedings. It was possible panic that they had to provide against.—Mr. Bros agreed that it was a very serious matter, and imposed the full penalty of £10 with 2s. costs.

MILE END CONTRACTOR CONVICTED.—At Old Street, on April 28th, James Calcutt was again brought before Mr. Dickinson on a charge of taking, by false and fraudulent means, from the guardians of Mile End a banker's cheque for £225 13s. 2d. Mr. Carmur, acting clerk to the guardians, stated that Calcutt had been a working plumber for Mr. Crow. In 1898 Mr. Crow was doing work for the guardians, and Calcutt took over the guardians' work from him in that year. From 1899 up to July, 1903, repairs, etc., at the scattered homes were done by Calcutt at scheduled prices, and the accounts would be rendered to the architect, who would present them to the Finance Committee. Turning to the specific charge against the defendant, Mr. Bodkin, one of the prosecuting counsel, described as unfair the charge of 6s. a load for carting away 62 loads of rubbish at Antill Road, and said the quantity was exorbitant. In answer to Mr. Robinson, who represented the defendant, the witness said it was never suggested at the inquiry that there had been collusion between the architect and Calcutt. The contrary was the case. Francis Phillips, of the Indestructible Paint Co., Ltd., having given evidence as to the quantities of paint purchased by Calcutt from his company, the case was adjourned. On the resumption on May 7th, Mr. William Henry Worsley, who is in the service of the Local Government Board as an architect and surveyor, stated that on inspecting the work at the scattered homes, he found that in some instances charges had been made for material which had not been used, while in others the charges were excessive.—At this stage, Mr. A. A. Robinson, defendant's counsel, said that he had advised his client to plead guilty to having made inflated and extravagant charges. Although he flinched from attacking any man, it must not be forgotten that the guardians had the professional assistance of Mr. Knight, whose duty it was to advise and check the accounts sent in from time to time by Calcutt. There had never been any suggestion of collusion between Mr. Knight and Calcutt, but, on the contrary, it had been clearly shown that there was friction. Consequently it was not likely that the former would connive with his client to make excessive charges. There was no doubt Calcutt had no intention of committing a fraud on the guardians, and he only desired to say with regard to the accused that the result of the prosecution had ruined him in his business. In mitigation of punishment, he asked that the course Calcutt was now adopting should be taken into consideration, as by his action he would be saving an enormous amount of time, trouble, and expenditure. Mr. Bodkin, K.C., prosecuting counsel, said that the amount fraudulently obtained in the bill mentioned in the charge was somewhere between £60 and £70. It must be borne in mind that the bill included items for work which was never done, and for materials which were never used.—Mr. Dickinson, having heard the prisoner plead guilty, said he was willing to deal with the case because by the prisoner's plea of guilty he saw some sign of regret and repentance, as well as a wish to save time and great expense. He would pass a sentence, which he considered proper under the circumstances, that Calcutt should be imprisoned for six months in the second division.

WOODEN BUILDING AND FIRE RISK.—At Long Eaton Petty Sessions, on May 5th, Bedford and Son, furniture dealers, were summoned for neglecting to cause a building to be enclosed with walls constructed of good bricks, stone, or other hard material, at Long Eaton, on April 14th. It appeared that the Council complained about this building on October 21st last, as the building was put up without a plan having been submitted. When a plan was sent in it was disapproved. Notice was next given to remove the building in fourteen days, but this notice was disregarded. The building, being of wood, was a danger to the adjoining property. Defendants were liable to a penalty of £5, and, further, to a penalty of 40s. for every day the building was allowed to stand after notice to remove.—Mr. Worrall, surveyor, said the Council had decided not to allow any more wooden buildings to be erected.—Mr. Bedford, jun., said he appeared before the Building Committee, and thought he gave a satisfactory explanation. Two months after he received notice to remove. This was not an isolated case, for there were hundreds of such buildings in the town. The Council had decided to prosecute two or three owners, but only this case had come up.—The Bench fined defendants 20s., and costs, but made no order, advising them to pull down the building.

Our Plate.

Some Designs for Doorways, by James Gibbs.

The eight doorways which we illustrate this week are designed in accordance with Gibbs's well-known rule that the height of the opening should be, usually, twice the width, and that in no circumstances should it exceed twice the width plus one-sixth. In arched doorways Gibbs deprecates the use of imposts, unless they can be placed above the height of a man. Sir William Chambers recommends the same general proportion as Gibbs for the apertures of gates and doorways, and adds that "Necessity probably gave birth to this proportion, which habit confirmed and rendered absolute."

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
The querist's name and address must always be given, not necessarily for publication.

Calculating Stresses in Ring.

Writing in reference to the enquiry under this head on page 381 of our issue for April 29th, Mr. Daniel West, of Ryde, I.W., says: "Perhaps your correspondent 'Retlaw' might like to know that a method of calculating metal ring-stresses was described in my article on 'The Calculation of Stresses in Steel Domes,' published in your issue of January 29th last. He might find this an advantage in checking his calculations, as the results obtained agree exactly with those obtained by 'A.'s' method."

Division of Contract for Building.

PERPLEXED writes: "I notice that the contract recently placed for the Birmingham Council House extension is restricted to the foundations, basement, and ground floors. It appears to be quite usual in large buildings to contract in sections. Why is this done?"

To expedite the work. The drawings for the foundations, basement, etc., are first got out, and the contract let without delay, so that whilst this portion of the work is being carried out the complete drawings for the superstructure can be prepared and the remainder of the contract let in good time for the steelwork, stonework, and other material to be prepared ready for fixing.

Insurance Surveyor's Training.

THORNTON HEATH. — "INSURANCE" writes: "What are the duties of a surveyor to fire insurance companies? Is there any special training required? And where can such training be obtained?"

An architect's or a surveyor's training is essential for the duties of an insurance surveyor on the building side. Classes in connection with insurance subjects are held at the London School of Economics, Clare Market, W.C., and there are examinations under the direction of the Federation of Insurance Institutes, of which particulars are obtainable from the London Insurance Institute, Queen Street, Cheapside, E.C. E.O.S.

Right to Cut Down Trees.

LIVERPOOL.—ENQUIRER writes: "A owns two adjacent plots, and on one of the plots is a house of which B is the tenant. C builds a house on the other plot. Can A cut down the trees on the plot on which B's house stands, or is it necessary to obtain the permission of tenant B?"

The answer to this enquiry depends entirely upon the wording of B's lease, or other agreement of tenancy. If A has let the house and its grounds to B without any reservation, it is quite certain that the trees cannot be cut without the tenant's permission, because they are included in his tenancy, just as much as the house itself is. To justify A in cutting the trees, it is necessary that the timber or "timber-like trees" should have been specially reserved to the landlord out of the tenancy, and there must also be power reserved to him to cut and carry away the timber. Unless this is the case, the landowner has no power to cut timber so long as the tenancy exists. F.S.I.

Sound-proof Partitions.

LONDON.—W. writes: "Is there on the market a really sound-proof folding partition, such that a class of children learning lessons in one room would not be disturbed by a class having a singing lesson in an adjacent room separated by this partition? If not, could you suggest a method of making one?"

The requirement you put forward is an extremely drastic one, especially with a folding partition. Doubtless, it would be possible with a fixed partition, filled with an abnormal thickness of slag wool, absolutely to prevent sound passing from one room into another, but under school conditions this result would be difficult to achieve, though slag wool is undoubtedly the best material that could be used for the purpose. As regards sound-proof partitions on the market, we would refer you to specialist firms such as Messrs. J. A. King and Co., 181, Queen Victoria Street, or The Frazzi Fireproof Construction Co., Durward Street, Whitechapel, E.

Reinforced Concrete Cells.

YORK.—W.B. writes: "Should I be infringing any existing patent if in the construction of concrete walls for coal cells I inserted $\frac{3}{8}$in. iron rods, vertical and horizontal, simply platted across each other without any connecting links? How thick would concrete walls require to be for coal cells 28ft. long by 8ft. high—(1) without the bars, (2) with them?"

The writer cannot say whether any patent would be infringed in carrying out the suggestions. Plain concrete walls for coal cells 8ft. high might be made 2ft. 6ins. thick at the bottom and 6ins. at the top, tapered on both sides as shown in Fig. 1. With coal filled up to the level of the top on one side and empty on the other, the maximum stress will be 18.67 cwts. per sq ft. at the base. With iron rods inserted near each face at 9ins. centres, alternately on the two sides, and horizontally at every 18ins., as in Figs. 2 and 3, the thickness might be reduced to 6ins. throughout, with a foundation as shown. Both these walls may be taken as just sufficient for the work named with only a very small margin, and if it is intended to heap up the coal in the cells they will require to be considerably thicker, say 50 per cent.

HENRY ADAMS.

"Men Who Build."

CAMBRIDGE. — D.H.S.C. writes: "I should be glad to know whether your series of 'Men who Build' articles has been republished in any form. If not, can separate copies of some of the issues be now obtained? I am anxious to have an account of the works of the following architects: Mr. John Belcher, Mr. John Bilson, Mr. Reginald Blomfield, Mr. W. D. Caröe, Mr. T. E. Collcutt, Mr. A. W. S. Cross, Mr. E. Guy Dawber, Mr. Ernest George, Mr. J. A. Gotch, Mr. H. T. Hare, Professor W. R. Lethaby, Mr. E. L. Lutyens, Mr. Arnold Mitchell."

The series in question has not been re-published. We have dealt with Mr. T. E. Collcutt, Mr. E. Guy Dawber, Mr. Ernest George and Mr. Arnold Mitchell, but these numbers are out of print.

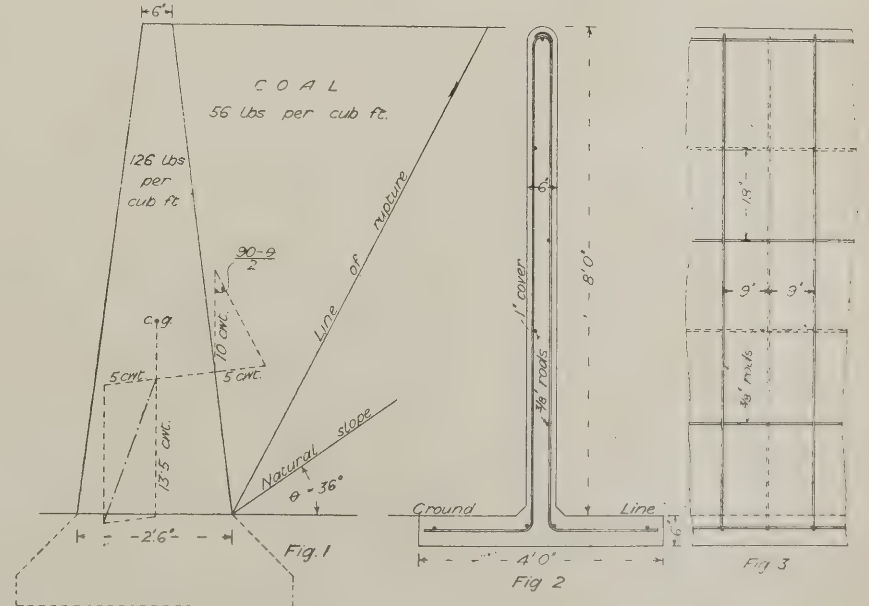
Renaissance Work Near Rugby.

BILTON.—H.S.D. writes: "What good Renaissance work is there within 12 to 20 miles of Rugby?"

Any of the following buildings, within a radius of 20 miles of Rugby, will be found to contain good Renaissance work worthy of study and measurement:—

Leicestershire: Nevill Holt Hall, near Market Harborough, an interesting old mansion, the seat of Sir Bache Cunard, Bart.; Carlton Hall, 3 miles from Kibworth station—a fine Jacobean house. Leicester, the old Town Hall, 1636 A.D., with a fine chimney-piece in the mayor's parlour; Queenborough Hall; Shenton Hall, near Market Bosworth, built 1629 A.D.

Northamptonshire: Dingley Hall, 3 miles east of Market Harborough—a very picturesque old house, the seat of the Viscount Downe; Glendon Hall, 2 miles west of Rotherell, with a fine porch by Inigo Jones, brought from the famous old Pytchley Club House; Rothwell Market House, a notable example, built in 1577 A.D., by Sir Thomas Tresham; Thorpe Hall, a fine Jacobean mansion, $2\frac{1}{2}$ miles west of Kettering; Fretwell, a delightful early 17th century house; Sywell House, near Wellingborough. Northampton: All Saints Church (the original church, of which the tower only is remaining, was a Gothic building, and was burnt down in the fire—second only to the great fire of London—which destroyed the central portion of Northampton in 1675); the County Hall, on the



REINFORCED CONCRETE CELLS.

south side of All Saints Churchyard—a very fine stone specimen of a late Renaissance building, completed in 1678. (The plaster ceilings in the two courts should be noticed); Haselrig mansion, commonly called Cromwell House, Mairfair, a 15th-century building; Old House in St. Giles Square; Althorp Park, half a mile from the station of that name on L. and N.W. Railway, dates from the beginning of the 16th century: is the seat of Earl Spencer. In the park is the Falconry, a unique structure built in 1612-13, during the reign of James I.— a beautiful specimen of Renaissance work; Holdenby House, 1½ miles north-east of Althorp Park. The remains of this once magnificent building are very scanty, but are quite worth a visit, if only for the sake of the gateways to the Base Court, built 1585 A.D., and a fine interesting Renaissance screen in the church, which was formerly the great hall screen in the old house; Gayton Manor House, near Blisworth, of late 16th-century date, is built in the form of a cross, and contains some fine old doorways; Easton Neston, one mile from Towcester (L. and N.W. Railway), a fine old stone house, the greater part of which was completed in 1713 from designs by Nicholas Hawkesmoor; Stoke Park, four miles from Towcester, a fine old stone mansion built in 1630-34 by Sir Francis Crane, from designs by Inigo Jones; Weston Hall, between Banbury and Towcester—an early 17th-century house; Canons Ashby, Moreton Pinkney station (L. and N.W. Railway); Charwelton Manor House (Great Central Railway), between Banbury and Daventry, contains some fine old 17th century carved panelling with grotesque heads and figures; Marston Manor House, near Byfield, has a great deal of interesting carved oak of about the date 1610, of unusual design (similar carving will also be found in the Church); Fawsley, two miles from Charwelton, is a stately old manor house of 16th century date. The fine old Dower House in the Park, last tenanted in 1710, should on no account be missed; Norton Hall, two miles East of Daventry, is a good old house, built in late 16th century, by Sir Richard Knightley.

Warwickshire: Binley, three miles from Coventry, on the Lutterworth Road, has an interesting church, built in 1773, in the Adam style; Wolvey Hall, three miles N.E. of Shilton, between Rugby and Nuneaton, built at the end of the 17th century; Arbury Priory, near Nuneaton, the seat of Mr. F. A. N. Newdegate, contains some fine panelling in the chapel, with carving by Grinling Gibbons. The stables are a most successful Renaissance example, in brick and stone, from designs by Inigo Jones, with a central porch by Sir Christopher Wren; Maxstoke Castle, near Coleshill, and Walsgrave Hall, have portions of 17th century date; Grimshaw Hall, half-a-mile from Knowle, a fine specimen of timber framed manor house, of early 17th century date; Kenilworth Castle (the porch to Gate House is a fine example); Stoneleigh Abbey, near Kenilworth, an excellent stone building built in 1720, contains some interesting detail work. Warwick: The Priory, a beautiful old mansion; the Town Hall, a very simple and dignified treatment of Renaissance, well expressing its purpose; a shop in the High Street, close to the Town Hall, an admirably conceived design in stone and plaster: Wormleighton, 1¼ miles from Fenny Compton, quaint old gate house to the Manor, dated 1613; Chesterton, three miles S.W. of Southam, has a fine Jacobean gateway N. of churchyard, built 1632, from designs by Inigo Jones, all that remains of the famous Peyto Mansion.

If "H.S.D." wishes to measure a public building, he cannot do better than take Northampton County Hall, or Warwick Town Hall; or amongst domestic work, Althorp Park Falconry, Arbury Hall Stables, or Stoke Park. Permission to measure can no doubt be obtained from any of the occupiers or authorities using the buildings. D.G.Mc.I.

———

Cantilever for Gallery.

CASTLEFORD.—W.F.C. writes: "Kindly give a diagram and formulæ for fir principals to a gallery floor as shown in the rough sketch plan enclosed (not reproduced). There is to be no support under the gallery floor. If the scheme is workable, what would be the size of the timbers?"

The load on the gallery may be taken as one cwt. per sq. ft.; and as the principals are 9 ft. apart, the load per foot length of the cantilever will be 9 cwt. Fig. 1 shows the sizes of timbers that may be adopted, Fig. 2 giving the equivalent frame diagram with the loads on it, and Fig. 3 the bending-moment diagram. The

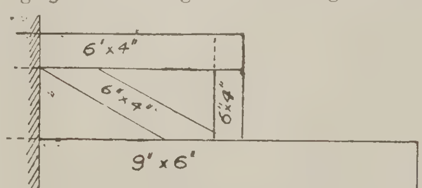


FIG. 1.

SCALE OF FT.

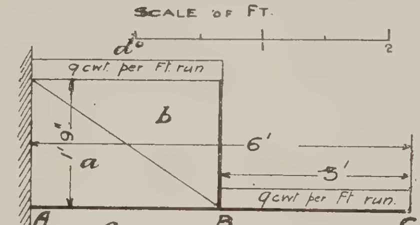


FIG 2

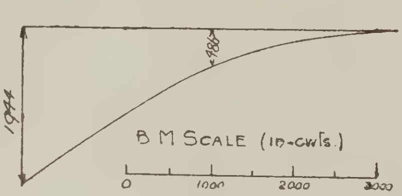


FIG 3.

last-mentioned figure is a parabola, and shows a maximum value at the wall, the value there being $\frac{Wl}{2} = 54 \times 6 \times 12 \times$ 1944 inch-cwt. Now consider the strength at the point B. The bending-moment here is equal to 486 inch-cwt. Taking a working stress of 6 cwt. per sq. in. as suitable for a live load, we see that the necessary modulus of section $= \frac{486}{6} = 81^3$ in. This would be given by a 9 in. by 6 in. section, whose modulus $= \frac{bh^2}{6} = \frac{6 \times 81}{6} = 81^3$in. Next consider the strength of the trussed portion. By the method of sections stress in bar *ac* × 2 ft. = bending moment at A. Therefore the stress in bar *ac* $= \frac{1944}{21} = 92{\cdot}6$ cwt., so that the 9 in. x 6 in. section will be ample. The other sizes are found in similar manner, and may be as shown. If the stability of the wall is considered, it should be made at least 18 in. thick, or else special means must be provided to relieve the wall from the bending stresses. In such a case as this, a steel cantilever would more usually be adopted. A.

———

Mixing White Roughcast.

CARDIFF.—T.J.B. writes: "What are the materials, how are they mixed, and how applied to the wall, of white stucco, such as that used by Mr. Voysey in his country houses, and what is the cost per super foot?"

White roughcast, similar in appearance to that used by Mr. Voysey, may be composed of two parts pure lime to one part sand for the rendering and floating coats, finished by dashing on a thin mixture of lime and small pebbles with the back of a trowel before the floating has set. A board should be temporarily fixed below the place where the plasterer is rough casting; to catch the surplus material (of which a considerable proportion does not adhere); it can then be returned to the bucket containing the mixture each time the board is moved, and will obviate much mess and some waste of material. Better protection, however, is given by the use of Portland cement roughcast, applied as follows:—Rake joints of brickwork, rough, render, and float with one part Portland cement to three (or four) parts of sand, and rough cast with a similar mixture, with the addition of small pebbles (specify gauge according to texture required, say none larger than would pass a ½ in. diameter ring), applied at the consistency of thin batter, by quickly and evenly dashing on with a hollow trowel. Twice limewhiten after as long an interval as possible to allow cement to dry out. The movable board, as above described, should be similarly applied in this case. This latter method is believed to be the one always followed by Mr. Voysey. The cost of this work should be approximately from 2d. to 3d. per super. foot (London pricing).

———

When a Valuer's Licence is Necessary.

BRISTOL.—W.J.S. writes: "Kindly state whether it is necessary to obtain a valuer's licence (£2 2s.) in order to value certain premises for mortgage."

An Inland Revenue licence (£2 2s.) entitling the holder to act as an appraiser or valuer is only needed when one makes a valuation as between two parties, i.e., acts in some degree at least as as arbitrator between them (either by oneself or in conjunction with another valuer). When a valuation, either of real or of personal property, is made merely for the information of one person, the valuer needs no licence. In the case of a mortgage, the appraisement is made only for the information of the proposed mortgage, and therefore no licence is required; nor need any stamp be affixed to the paper on which the valuation is written. F.S.I.

Modern London Hotels.

LONDON.—O.P. writes: "I shall be glad to know whether you have published any illustrations of new hotels in London."

In our issue for July 11th, 1906, we gave a special supplement on the Ritz Hotel, and in earlier issues published a series of photographs and plans showing the erection of the building. In the issue for June 21st, 1905, we dealt with the Gaiety Hotel, and in the issue for June 22nd, 1904, with the Savoy Hotel extension;

while in our special issue last Christmas we published views of the Piccadilly Hotel, the Waldorf Hotel and the Imperial Hotel.

Fire Tests of Steel Constructional Work.

ACOCK'S GREEN.—W.B. writes: "Please state whether any official tests have been made as to the depreciation of iron or steel constructional work during a fire, and the subsequent cooling process by water during extinction."

No such tests appear to have taken place in England. As to any tests having possibly taken place in America, the querist should apply direct to Professor Woollson of Columbia University, New York. E.O.S.

Special Notice.—We have received so many enquiries about buildings to measure, and have published so many replies—covering the whole kingdom—that we must decline to undertake any more. The majority of such enquiries are sent by students entering for examinations, and however interesting the information may be to the few persons concerned, we do not think it warrants any further space being allotted to it. In a few weeks' time we shall publish a tabulated list of the buildings about which particulars have been given in our columns under this head, and we must then request readers who require information to turn to our back issues, rather than formulate fresh enquiries for us to answer.

Notes and News.

MR. PAUL OGDEN, F.R.I.B.A., has been elected president of the Manchester Incorporated Society of Architects.

* * *

THE COLUMBIAN FIREPROOFING CO., LTD., of 37, King William Street, E.C., have received orders to construct the concrete floors at Messrs. Stollwerck's chocolate factory, Nile Street, Hoxton, and at Messrs. Burroughs' distillery, Lambeth.

* * *

ARCHITECTURE AT THE ACADEMY.—By a slip of the pen, in the notice of the architectural exhibits at this year Academy which appeared in our issue for last week, we gave Mr. Oldrid Scott's name instead of Mr. Gilbert Scott's when referring to the London County Hall designs.

* * *

MR. W. H. WOODROFFE, F.R.I.B.A., of 57, Lincoln's Inn Fields, W.C., has been appointed architect to the Governors of the Seckford Hospital and Woodbridge Endowed Schools in succession to Mr. Ernest Carritt, recently deceased, who occupied the position for many years.

* * *

OLD BUILDINGS IN AND AROUND NEWCASTLE. — The Northern Architectural Association have reprinted their list of "Some Ancient Buildings in or near Newcastle-upon-Tyne." Copies can be obtained from the hon. secretary, Mr. C. S. Errington, A.R.I.B.A., Victoria Buildings, Grainger Street West, Newcastle-upon-Tyne, price 6d.

* * *

"SCREENS AND GALLERIES IN ENGLISH CHURCHES."—A book on this subject by Mr. Francis Bond (author of "Gothic Architecture in England") is about to be published by Mr. Henry Frowde. Mr. Bond begins with the rood beams of the early Christian churches, then traces their development into the quire screens and rood screens of the mediæval churches of England, and shows how the transposition of the rood lofts to the west of the parochial naves led to the galleried churches of the seventeenth and eighteenth centuries. The book will contain illustrations of 2,000 screens and lofts, there being 152 photographs and measured drawings.

* * *

A NEW GRAMMAR SCHOOL FOR COLCHESTER is to be built by the Essex Education Committee at a cost of £8,600.

* * *

CHANGE OF ADDRESS. — Messrs. Lovegrove and Papworth, architects, have removed their offices from 170, High Street, Shoreditch, to Town Hall Chambers, 374-8, Old Street, E.C.

* * *

A SCHEME FOR RESTORING WHALLEY PARISH CHURCH has been based upon two reports that have been prepared by Mr. E. S. Prior, F.S.A., F.R.I.B.A., and has been unanimously adopted at a parish meeting.

* * *

MESSRS. PATMAN AND FOTHERINGHAM, LTD., of 100 and 102, Theobalds Road, W.C., have secured the contract for rebuilding Nos. 4 and 6, Glasshouse Street, Piccadilly Circus, W. (architect, Mr. E. Keynes Purchase).

* * *

SALFORD TOWN HALL TO BE EXTENDED. —At last week's meeting of the Salford Town Council a long discussion took place in reference to the Town Hall. Ultimately it was decided to erect an annexe to the building at a cost of £20,000, an amendment to build a new Town Hall, at a cost of £100,000, being defeated. Plans for the annexe have been prepared by the Borough Engineer.

* * *

MESSRS. RICHARD CRITTALL AND CO., of 197, Wardour Street, W., are now licensees for the "Barker Patent Cable System" of hot-water heating. There are many advantages attaching to this system, which has already been successfully installed in numerous buildings. Messrs. Crittall are carrying out at their own offices a show installation, which will shortly be ready for inspection.

* * *

THE HYDRAULIC LIFTS AT THE LANGHAM HOTEL, Portland Place, W. (where extensive alterations are now being carried out), are being converted to work by electric power, as it has been calculated that considerable saving will be effected thereby. The work has been entrusted to Messrs. Archibald Smith and Stevens, of Battersea (under the direction of Messrs. O'Gorman and Cozens-Hardy, consulting engineers, acting for the hotel company). There are three lifts—two for passengers and one for goods.

* * *

EXPERIMENTS ON EARTH PRESSURE.—A series of experiments on earth pressure conducted in a small special laboratory by Mr. F. Engesser, of Karlsruhe, were designed to elucidate not only the pressure of the soil on retaining walls and dams at various inclinations, but also the pressures exerted by unsupported masses of earth, which latter have not as yet been fully inquired into. The conditions of the various tests are explained by reference to the geometrical theory of earth-pressure. The substance employed for the tests was washed quartz-sand. The author shows that the pressures exerted by freshly filled soil are from 30 to 50 per cent. greater than those showing when the soil has assumed a condition of final repose, but the ultimate pressures observed coincide very closely with those deduced from the formulæ.

* * *

"TOWN PLANNING IN THEORY AND PRACTICE" (1s.; Garden City Association, 602-3, Birkbeck Bank Chambers, Holborn, W.C.) consists mainly of a report of the conference arranged by the Garden City Association at the Guildhall, London, in the autumn of last year. Speeches delivered or papers read on that occasion by Mr. Nettlefold, Mr. Aneurin Williams, Mr. T. C. Horsfall, Sir Aston Webb, Mr. Alderman Thompson, and other leaders in the town-planning movement, deal with nearly every phase of the problem. Several of these contributions are perhaps of sufficient value to justify publication in the present form; but these, with the illustrations of a few examples of approved planning, and the appendices relating to certain interesting phases of the history of the movement, can hardly be said to vindicate the rather ambitious title.

* * *

L.C.C. WORKS COMMITTEE TENDERS. —The London County Council on February 11th, 1908, decided that when tenders were invited up to March 31st 1908, for the erection of a school, and for any works to an existing school, the Works Committee should be authorised to submit a sealed estimate of the cost, such estimate to be prepared, delivered, and dealt with in the same manner as, and concurrently with, the tenders. In connection with this arrangement, the Works Committee have submitted estimates in 18 cases, and in 7 cases the estimates were the lowest. The L.C.C Education Committee are of opinion that the operation of the arrangement should be extended until December 31st, 1908, and they have submitted to the Council a recommendation to that effect.

* * *

THE REBUILDING OF THE LONDON INSTITUTION, Finsbury Circus, was under consideration at a meeting of the proprietors held on May 6th, when the president, Lord Aldenham, stated that the Board, having deliberated upon the scheme for rebuilding and the scheme for reconstruction of the existing building, had decided in favour of the former course. Sir Aston Webb had expressed an opinion against any scheme that provided only for alterations. The scheme for rebuilding was carried with only about half-a-dozen dissentients in a meeting of about 300 proprietors, but a poll was demanded. The idea of the Board is to let the valuable site, on a ground lease, to builders who will erect new premises, allocate certain rooms to the Institution, and pay £3,000 a year for the privilege of letting the remainder of the building as business offices.

* * *

THE WIDENING OF BELVEDERE ROAD, LAMBETH, is recommended by the Improvements Committee of the London County Council, "in view of the proposal to erect the new County Hall on a site between Belvedere Road and the river Thames. The present average width of the road is only 37ft., and the proposal is to increase it to a uniform width of 60ft. Under the agreement with the Ecclesiastical Commissioners, the Council is at liberty to erect, to the line of the existing frontage to Belvedere Road, a building 60ft. in height to the top of

the parapet, but for every 3ft. by which it is desired to increase the height of the building beyond this limit, the frontage must be set back 2 ft. A widening of the road is therefore desirable, not only in the interest of the traffic and in order to provide a suitable approach to the new County Hall, but also in order that the site of the hall may be utilised to the fullest advantage. The committee are advised that, if a suitable improvement to a width of 60ft. be effected by setting back the frontage on the east side, a uniform line of frontage could be provided on the west side, and this would enable an area of .15 acre to be added to the County Hall site. Moreover, the Council would be under no obligation, if it desired to increase the height of the County Hall beyond 60 ft., to set back the frontage, and the area of the effective building site would thus be increased by .42 acre. The total length of street affected by the proposed improvement is about 580 ft.

* * *

EXTRAS ON A HOSPITAL CONTRACT.—Severe remarks on variations in contract accounts in connection with the erection of the Southern Hospital were made in reports presented to the Metropolitan Asylums Board on Friday last. The Works Committee stated that the accountant found it necessary to make deductions from the final accounts to the extent of £1,577. "The total amount of the contract was £176,050, which included a provision of £5,000 for general contingencies, and £2,400 for extra foundations (if any). The total sum payable to the contractors (apart from the special claims which were dealt with in our report to the board at their last meeting), was £185,388 15s. 8d., or a net increase over the contract sum of £9,338 15s. 8d. The principal items involving extras were £5,910 (gross) for works carried out consequent upon engineering works, or at the suggestion of the engineer-in-chief, duly approved by us, £3,600 (gross), for the laundry, etc., £5,063 (gross) for drainage, rainwater tank, overflow and sump, and £2,792 (gross) consequent on various orders of the Board. The Finance Committee concurred in the opinion of the Works Committee that 'it is somewhat surprising that deductions to the extent mentioned should have been found necessary in bills which had been through the hands of the quantity surveyors and architects.' They were also strongly of opinion 'that errors of this serious character should not have occurred.'"

Obituary.

THE LATE MR. C. F. BEEKS, architect, of Epsom, formerly in H.M. Office of Works, left estate which has been proved at £20,460.

MR. JOHN ESHELBY, late of the firm of John Eshelby and Sons, builders and contractors, Sheffield, died recently. He was 70 years of age.

MR. J. J. STEVENSON, F.S.A., F.R.I.B.A., the well-known architect, died in London last week in his 77th year. Many large houses in the West End were erected from his designs, commencing in 1870 with the Red House on Bayswater Hill, which was followed by the Yellow House—both very interesting examples of the revived so-called Queen Anne style; while later examples of Mr. Stevenson's work are to be found in Kensington Court; Lowther Gardens, Queen's Gate; South Street, Mayfair; and Buckingham Palace Road and Gardens. Of his work outside London we may mention the new buildings at Christ Church, Cambridge; the University Laboratory and Sedgwick Geological Museum at Cambridge; Kelvin Church, Glasgow; and the Peters Memorial Church at Stirling. The restoration of St. John's College, Oxford, was also carried out under his direction. Mr. Stevenson was an author of considerable learning, his book on "House Architecture" being well known.

MR. A. R. LETHBRIDGE, retired builder and contractor, who died on May 6th at Plymouth, served his apprenticeship as a plasterer. He began business as a building contractor in 1875, and afterwards, in partnership with his son, secured several large local contracts, including one of the blocks at Plymouth Market. He retired in 1899, and was succeeded in the business by his eldest son, Mr. Albert W. Lethbridge.

RETAINING WALLS IN THEORY AND PRACTICE.

BY T. E. COLEMAN.

(*Continued from page 340. No. 688.*)

Centre of Pressure for Retained Earth.

A vertical wall supporting a bank of earth with horizontal top is indicated in Fig. 53, the angle D B H being the angle of repose (ϕ). It has been found that for all practical purposes the plane of rupture bisects the angle made by the vertical plane A B and the angle of repose, so that the mass of earth pressing upon the back of the wall is represented by the wedge-shaped portion A E B. It is generally assumed for ordinary homogeneous earths that the earth pressure uniformly increases with its depth, in a similar manner to that of water pressure. The pressure upon the back of the wall is therefore represented graphically by the diagram A F B, the intensity of horizontal pressure at any point being indicated by the length of the ordinate at that point, whilst the area of the pressure diagram A F B is equivalent to the total pressure on the wall. The resultant horizontal pressure of earth may be represented by a single horizontal force (P) acting at a height of $\frac{1}{3}$rd A B above the base B M, and intersecting the vertical plane A B at the point C, which is the centre of pressure for the retained earth. Fig. 54 is the section of a vertical retaining wall with surcharged earth, and, as in the preceding instance, the centre of pressure for the horizontal thrust of the retained earth at the back of the wall occurs at a distance of $\frac{1}{3}$rd the height of the vertical plane A B, above the base B K.

For a wall having offsets at back, and retaining surcharged earth, as in Fig. 55, the portion of earth A B D in *front* of the vertical plane A B is assumed to exert no thrust upon the wall, its weight being compounded with the weight of the wall D B K F, so as to obtain the resultant weight or pressure of the wall and earth, which, resting on the base B K, and acting through the common centre of gravity, tends to resist the overturning action of the retained earth behind the vertical plane A B. The centre of pressure of the retained earth is at the point C, at a height of $\frac{1}{3}$rd A B.

Fig. 56 shows a battering retaining wall of uniform thickness, having a portion of the wall (A B D) projecting beyond the vertical plane A B. The centre of pressure C = $\frac{1}{3}$rd A B. If the wedge of brickwork, concrete, or masonry A D B had been earth, it would have been supported by the earth immediately below it. The excess of weight of the portion of the wall A D B over a similar bulk of earth is consequently compounded with the weight of the wall A B K F, so as to obtain the total weight resting on the base B K. This total weight acts through the common centre of gravity of the wall A B K F, and excess weight of the wedge-shaped portion of wall A B D. The excess weight of the portion A B D consists of the extra weight of the masonry as compared with the same bulk of earth. The total weight of the wall acting upon the base B K and the position of its centre of gravity can therefore be readily determined.

Magnitude of Pressure of Retained Earth.

As already mentioned, the total earth pressure at the back of a retaining wall consists of the weight of earth contained between the plane of rupture and the vertical plane at the back of the wall. Fig. 57 is a section through a retaining wall supporting a bank of earth without surcharge, the angle D B H (ϕ) being the angle of repose. The angle A B H is bisected in B E, which is the plane of rupture. By the wedge theory of earth pressure, the portion of earth A B E is directly supported by the wall, the resultant pressure acting at a height of $\frac{1}{3}$rd A B, the point C being the centre of pressure. Let J K represent the weight of the wedge of earth A B E for a unit foot in length, acting through its centre of gravity and intersecting the plane of rupture at K. Draw K N perpendicular to B E, and make the angle M K N = H B D = ϕ. Then the horizontal line J S represents the total normal pressure against the vertical plane A B, of the earth wedge A B E which is tending to slide down the plane of rupture B E, and acting at the centre of pressure C.

It can be shown that the angle A B E = angle J K S. Let x = angle A B E = angle J K S; w = weight of earth per foot cube; and A B = h. Then

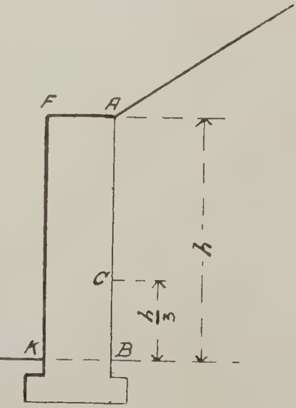


FIG. 54.

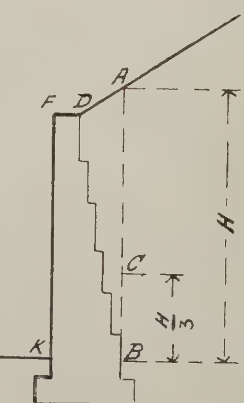


FIG. 55.

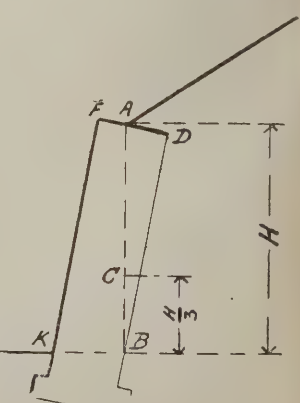


FIG. 56.

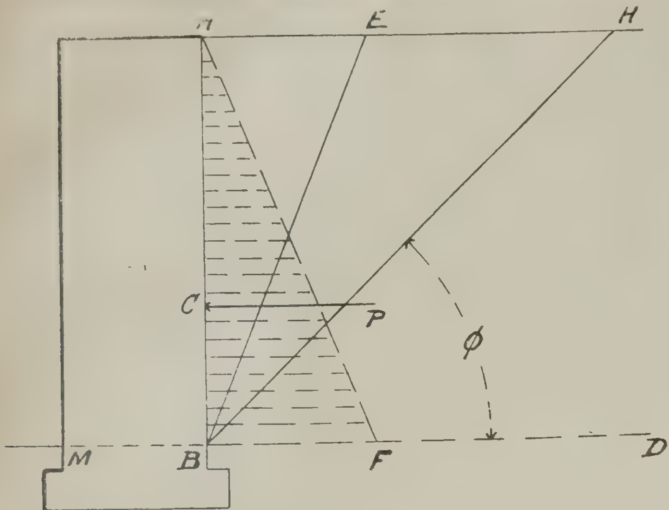


FIG. 53.

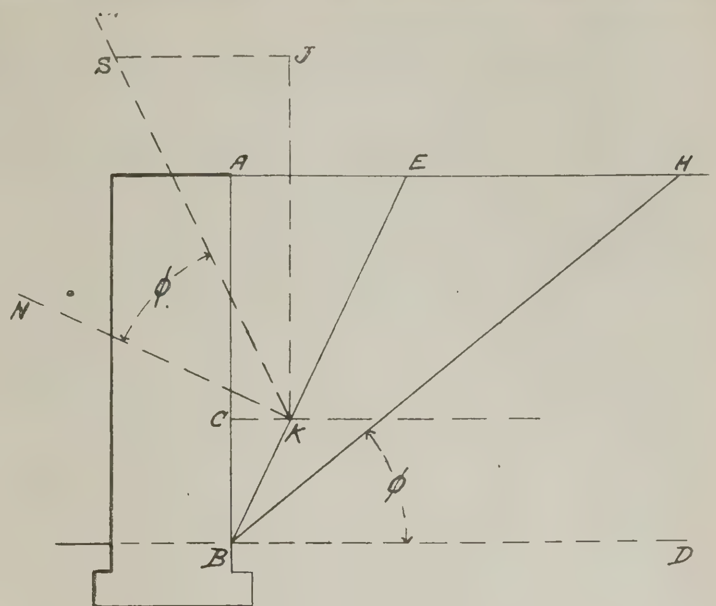


FIG. 57.

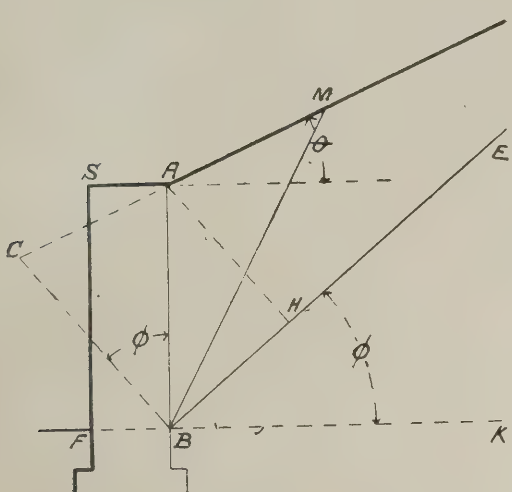


FIG. 59.

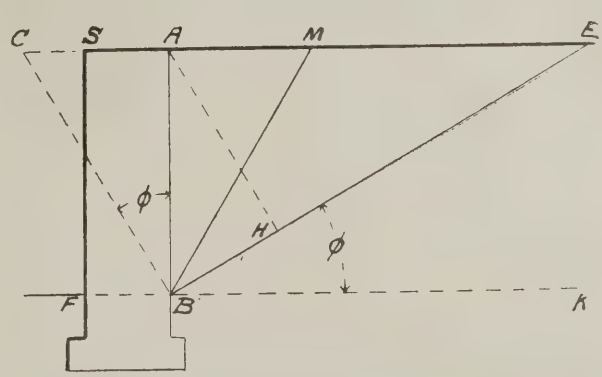


FIG. 58.

the total earth pressure J S = J K tan x = A B tan x = h tan x. But J K equals weight of the prism of earth A B E for a unit foot in length $= w \times \frac{AB \times AE}{2} = \frac{1}{2}\, w h \times h \tan x$ $= \frac{1}{2}\, w h^2 \tan x$. Therefore the total horizontal earth pressure (J S) upon the vertical plane at the back of the retaining wall $= \frac{1}{2}\, w h^2 \tan^2 x$

$= \frac{1}{2}\, w h^2 \tan^2 (90° - \phi)$.

It is interesting to note that the foregoing formula expresses exactly the same equation as that for finding the maximum pressure or thrust of water instead of earth under the same conditions. Let w = weight of water in lbs. per foot cube, and D = depth of water in feet. The total pressure of water acting on the vertical face of a retaining wall per foot in length is represented by the contents of right angle triangle, having a height and base of the same length as the depth of the water and one foot thick, so that

$$\text{total hydrostatic pressure} = D \times \frac{D}{2} \times w$$

$$= \frac{w D^2}{2}$$

On comparing the two equations, it will be seen that in the case of water the element of friction is absent, so that $\phi = 0$, and the first-mentioned equation then becomes

$$\text{total pressure} = \tfrac{1}{2}\, w h^2 \tan^2 \tfrac{1}{2}\, 90°$$

$$\text{but } \tan 45° = 1$$

therefore

$$\text{total pressure} = \tfrac{1}{2}\, w h^2 = \frac{w D}{2}$$

It will be seen that the amount of pressure or thrust upon a wall supporting dry earth without surcharge varies according to the angle of repose of the retained earth, and the weight per cubic unit of the earth. When a wall supports a surcharged bank, then additional pressure is brought upon the wall in consequence of the extra weight of the surcharged earth.

According to the wedge theory, the total value of the horizontal pressure of retained earth upon a vertical plane (as in Fig. 58) under ordinary conditions may also be ascertained from the following general statement :—

$$\text{Total horizontal earth pressure} = \frac{w}{2}\left\{\overline{BC} - \sqrt{\overline{BC}\,(\overline{BC} - \overline{AH})}\right\}^2$$

This formula expresses the relationship between the horizontal thrust upon the vertical plane and the perpendiculars to the angle of repose, drawn respectively from the extremities of the vertical plane to the plane of the surface slope.

The general construction is shown in Fig. 58, BC being drawn from the lower extremity of the vertical plane A B at right angles to the angle of repose and meeting the continuation of the plane of the surface slope at C. The line A H is drawn from the upper extremity of the vertical plane at its intersection with the surface slope, and perpendicular to the angle of repose.

The foregoing expression is applicable not only to banks of retained earth with horizontal top, as in Fig. 58, but also to all ordinary conditions of indefinite surcharge, as indicated in Fig. 59, and will be found of very great assistance when computing the value of earth pressures by means of the graphic method.

The total horizontal pressure of earth upon a vertical plane at the back of a retaining wall—either with or without surcharge—may also be conveniently ascertained from the equations formulated by the late Professor Rankine. The equation for earth without surcharge is expressed in terms of the angle of repose, whilst for earth with surcharge the equation is given in terms of the angle of repose and of the angle made by the surface slope.

Let

P = total horizontal earth pressure in lbs.
w = weight of earth per foot cube in lbs.
H = height of vertical plane at back of wall in feet.
ϕ = angle of repose of earth.
θ = angle of slope of surcharge with the horizontal plane.

The following expression is given by Rankine for ascertaining the total pressure of earth for a wall *without surcharge* the top of the earth being level with the top of the wall.

$$\text{(A)} \qquad P = \frac{w H^2}{2} \times \frac{1 - \sin\phi}{1 + \sin\phi}$$

This equation is merely another form of expressing the same result as already obtained, viz. :—

$$P = \frac{w H^2}{2} \tan^2 \tfrac{1}{2}\, (90° - \phi)$$

For calculating the stability of walls, either form of equation may be adopted, as may be found most convenient for the purpose.

(To be continued.)

Views and Reviews.

Analysis of Paints and Pigments.

Mr. Clifford Dyer Holley, Professor of Industrial Chemistry in North Dakota Agricultural College, has, with the assistance of a fellow-professor, Mr. E. F. Ladd, published in book form the matter primarily prepared for the instruction of the author's classes in industrial quantitative analysis. It is the author's hope that he has produced a "work that will serve as a guide to a chemist of ordinary training in taking a can of mixed paint, of practically any shade or tint, making a complete analysis of it, and furnishing him sufficient data, derived from a large number of analyses, so that he may interpret the results of his own analysis in a rational manner." Here the author's meaning is sufficiently clear, but it is to be hoped that his science is sounder than his syntax. The author at any rate offers, in guarantee of thoroughness, the statement that every method described in the work has been completely demonstrated in the author's laboratory. It is impossible to refrain from quoting the following gem of thought, which occurs in a section contributed by Mr. Ladd: "Few persons are familiar with the composition or working qualities of paints. There are few subjects of greater importance to the builder, since the appearance of a building is to be judged largely by the character of the finishing coat, which is paint." Which is quaint.

Analysis of Mixed Paints, Colour Pigments, and Varnishes. By Clifford Dyer Holley, M.S., Ph.D., and E. F. Ladd, B.S. New York: John Wiley and Sons. London: Chapman and Hall, Ltd., 10s. 6d. nett.

Paint from the Practical Side.

Of more general use and interest than the foregoing work is Mr. Frederick Maire's treatise on the origin, manufacture, and application of pigments and vehicles. Mr. Maire avoids, as far as possible, the purely scientific point of view, and writes "for the men who use or sell pigments, and who mainly want to know what they can expect of them." Mr. Maire, having perceived quite clearly what was wanted has known well how to supply the need, and the result is a book of considerable practical value.

Modern Pigments and their Vehicles. Their Properties and Uses Considered, mainly from the Practical Side, and How to Make Tints from Them. By Frederick Maire. Same publishers. 8s. 6d. nett.

For the Ambitious Workman.

It is no doubt to the aspiring craftsman that this very cheap manual will appeal most. At the same time, such a concise and comprehensive account of the duties and responsibilities of the builder's foreman is well worth a place on the bookshelf of the architect or builder; a fair index suggesting its value as a work of reference. It contains eighty-nine illustrations.

The Builder's Foreman. A Practical Handbook for the Ambitious Workman, the General Foreman, and the Master Builder. By George Metson, P.A.S.I. London: John Dicks Press, Effingham House, Arundel Street, Strand, W.C. 6d.

A Comprehensive Survey.

In the same series as the above-noticed booklet on the builder's foreman is a rather ambitious treatise on surveying. The editor claims that "this little book differs from most—probably all—other books on surveying, in three respects: (1) It covers a wider range of subject matter; (2) it is much smaller; and (3) it is much cheaper." It would be easier to assent to each and all of these propositions if No. 2 did not seem to threaten the demolition of No. 1. The book is no doubt useful, but it embraces too many interests. It not only includes such divers operations as land surveying and the making of a sanitary survey, but also offers instructions on surveying for the valuation of property, and closes with a chapter on dilapidations. The "all-round man" may possibly appreciate so much variety; but, nevertheless, the booklet seems too comprehensive to be really useful in every department.

§Surveying. Including Land and House Surveying, Valuations, Dilapidations, etc. Edited by Hugh B. Philpott. Same publishers and price.

Penny Practical Pamphlets.

The penny pamphlets on practical subjects that are being issued by Messrs. Cassell ought to do something towards removing the reproach of crass ignorance that is so freely levelled at the British workman; but unfortunately it is only the intelligent workman who can be persuaded to read anything concerning the technicalities of his craft, and, in a penny pamphlet, the treatment of the subject is necessarily so meagre and scrappy as to render it questionable whether the intelligent workman could derive much advantage from them. Still, the aim is good, and the execution is all that could be expected at the price.

¶Electricity in the House. Decoration of the House. Mensuration for Handicraftsmen. "Work," Hasluck's Series. Edited by P. N. Hasluck. London: Cassell and Co., Ltd. 1d. each.

PAINTS FOR IRONWORK.

Aluminium paints are prominent among the useful materials which have come into extensive use during the last five or six years, although their use is largely confined to beautifying and preserving iron work. These paints give a very handsome appearance, similar to dull silver, and they may be used with excellent effect on cast and wrought iron generally. The colour is much handsomer than grey, and these paints do not turn yellow or show the dirt as white paints. Two distinct classes of aluminium paints are now made, one suitable for inside work only, and the other for ironwork which is exposed to the weather. The paint intended for use on the inside withstands a very high heat, and is therefore suitable for use on steam radiators, etc. Some of the best aluminium paints are made on the principle of gold bronze paints, that is, with collodion varnish, but with this advantage, that the so-called bronze paints almost invariably tarnish, while the aluminium is practically unaffected by the atmosphere. The advantage of using collodion varnish is that, owing to the whiteness of the colour and the nature of the varnish, it is calculated to show off the metallic shade of the aluminium powder to the best advantage, and it has the additional advantage of drying practically instantaneously.

A new departure in painting that has been made during the past few years is that known as the "dipping process." It does not strictly apply to decorators' work, but consists in a method of dipping the article to be painted bodily in a special mixture of paint, so as to save the cost of application by the ordinary means. The method has been successfully used in the United States for many years past, and is in operation in this country in several large manufactories of agricultural implements, wagons, etc., and at the Royal Arsenal at Woolwich.

Bankruptcies.

E. Boulton, plumber, Crewe. Adj. April 29.

J. Ince, builder, Leytonstone. Adj. April 25.

J. S. Hibberd, builder, Frome. R.O., Adj. May 1.

J. A. Hingston, builder, Notting Hill. Adj. April 27.

E. Tabor, contractor, Cambridge. R.O., April 28. Adj. April 29.

T. Reynolds, builder and contractor. Rugby. R.O. and Adj., April 29.

F. G. Love, contractor, Bristol. Liabilities, £2,733; deficiency, £1,148.

Darlaston and Edwards, designers and contractors, Birmingham. Adj. April 25.

W. E. Westgate, builder and contractor, Romford. Liabilities, £3,231 10s.; assets, £1,653.

G. E. Richmond (trading as E. A. Richmond and Co.), timber merchant, Brixton. Adj. April 29.

W. and A. Ellingford, masonry contractors, Poplar. R.O., April 30. First meeting, Bankruptcy Court, London, May 15, at 11.

J. C. Satchwell and Co., builders and estate agents, London, E.C. R.O., April 30. First meeting, Bankruptcy Court, May 15, at 1. P.E., Bankruptcy Court, June 2, at 12.

J. Howell, trading as J. Hole, road contractor, Penselwood. R.O., April 28. First meeting O.R.'s, Salisbury, May 12, at 12.45. P.E., Town Hall, Yeovil, June 4, at 12.30. Adj. April 28.

G. A. Woolley, painter and decorator, Horncastle. R.O., April 28. First meeting O.R.'s, Lincoln, May 14, at 12. P.E., Sessions House, Lincoln, May 14, at 3. Adj. April 28.

H. J. Perkins, painter and house decorator, Redditch. First meeting, 191, Corporation Street, Birmingham, May 14, at 12. P.E., C.C., Birmingham, May 28, at 2.30. Adj. April 28.

F. Holmes and A. Holmes (late trading as F. and A. Holmes), builders, Leeds. R.O., April 29. First meeting, O.R.'s, Leeds, May 13, at 12. P.E., C.C., Leeds, May 26, at 11. Adj. April 29.

W. Whitley and E. Whitley (trading as William Whitley), prepared joinery manufacturers. R.O., April 27. First meeting O.R.'s, Bradford, May 11, P.E., C.C., Bradford, May 20, at 10. Adj. April 27.

Dissolutions of Partnership.

Hughes and Morris (R. R. A. Hughes and R. Morris), painters, plumbers, and decorators, 3, Station Road, Lytham, Lancs. Debts by R. R. A. Hughes. Each party will continue to carry on business on his own account.

Coming Events.

Wednesday, May 13.

Royal Society of Arts.—Mr. Clayton Beadle on "The Underground Water Supplies of the Thames Basin," 8 p.m.

Thursday, May 14.

Carpenters' Company.—Mr. Alex. L. Howard on "Timber—Its Qualities, Decay and Preservation—II.," at 7.30 p.m.

University of London.—Mr. W. D. Scott-Moncrieff on "The Engineering Aspect of Recent Advances in Connection with Sewering—II.," at 5 p.m.

Saturday, May 16.

Northern Architctural Association.—Visit to new church at Roker and Pier Works.

Saturday, May 16.

Junior Institution of Engineers. — Visit to Southwark and Bermondsey Storm Relief Sewer Works, 3 p.m.

Saturday, May 16.

Institute of Sanitary Engineers.—Visit to the Maldens and Coombe Sewage Disposal Works.

Edinburgh Architectural Association. — Visits (1) to Messrs. Doulton and Co.'s Works, Hawkhead, Paisley; and (2) to Anchor Line Buildings, St. Vincent Place, Glasgow.

Monday, May 18.

Royal Institute of British Architects.—Paper on "London Bridges," by Professor Beresford Pite.

Thursday, May 21, and Friday, May 22.

Surveyors' Institution.—Country Meeting at Dover.

Saturday May 23.

Architectural Association. — First Summer Visit, to a house designer, by Mr. E. L. Lutyens, at Sonning, and the "White Hart" Inn, designed by Mr. W. Campbell Jones.

OREVIGAN GRANITE QUARRY, NORWAY.

ARCHITECTURAL GRANITE.

(Continued from page 381, No. 690.)

Varieties of Granite.

The granite districts of Cornwall and Devon are situated as follows:—(1) on Dartmoor, (2) near St. Breward, (3) near St. Austell, (4) at Penryn, and (5) at Penzance. The first is the Devonshire deposit; the other four are situated in Cornwall. The granites of both Cornwall and Devon are, in the majority of cases, of coarse grain, having large crystals of felspar distributed throughout. The fact that fine-grained granite is not found there in such wealth as in other districts must naturally operate against the employment of granites from these counties.

Taking firstly the granite from the Dartmoor district, this is coarse grained, composed of quartz, felspar and mica, the mica being sometimes white and sometimes black and occasionally both white and black mixed together. The granite is frequently porphyritic and occasionally schorlaceous. Red, white, grey and blue granites are alike obtained from quarries on Dartmoor.

In the St. Breward district the granite is very similar to that from Dartmoor.

In the St. Austell district the granite is more variable in composition and is much more schorlaceous than in the two other districts mentioned above. The granite is coarse grained and has a good appearance when polished. It is chiefly grey in colour. It may be stated that in course of ages the granite in this district has undergone decomposition, and the resultant silicate of alumina from the felspar has provided great thicknesses of kaolin or china clay, which is valuable and much used for the manufacture of china and porcelain.

In the Penryn district the rock is more like that in the first two quarrying districts. The granite is not so schorlaceous as the third district mentioned, but the granite is often porphyritic and has been much worked in consequence. The colour of the granite is mostly blue grey.

In the Penzance district the granite is to a considerable extent schorlaceous also. The general colour of the granite obtained from this district is greenish grey.

Hornblendic granites are found at Shap Fell in Westmoreland, and also in Leicestershire. In the former district the rock may be called a porphyritic hornblendic granite. It varies in colour from light grey, dark grey, golden grey, pink, full red and deep purple.

Syenites are found in the Malvern Hills, in Leicestershire and Worcestershire and in North Wales. The Leicestershire syenites, situated in the Mount Sorrel district, are dark green, freckled pink, in colour, composed of pink orthoclase felspar, dark green hornblende in considerable quantity, and a little quartz. The stone is chiefly used for road metal and paving setts. In the Malvern Hills, Worcestershire, the syenite consists of reddish felspar, quartz, hornblende and some-

SCLATTIE GRANITE QUARRY, ABERDEENSHIRE: WORKING FACE.

times epidote. The syenite of North Wales is generally known as Penmaenmawr and is used chiefly for road-making purposes and for paving setts.

The Scotch granites belong to four districts:—(1) Aberdeenshire, (2) Kincardineshire, (3) Kirkcudbrightshire, and (4) Argyllshire. The Aberdeenshire granites come from the neighbourhood of Aberdeen or Peterhead, and are the most important deposits in the United Kingdom, their only formidable rival being the granites of Norway. They have been exported to many countries. The Aberdeen granite is grey or light blue in colour, while the Peterhead granite is pink or red. Both granites are practically true granites, although hornblende is found in some, but this is always in very minute quantities. The granite quarries in Kincardineshire are all situated in the northern part; the granite varies between dark grey and dark red. In Kirkcudbrightshire the principal quarry districts extend (1) from Loch Dee to Loch Doon; (2) from Loch Ken to Palnure Water; and (3) from Criffel to Craignair; the granite is grey in colour. The Argyllshire granites are of a warm red colour in some quarries, in others light grey, or dark grey with black specks.

In the Channel Isles granite is found in Jersey and Guernsey but the nature of the material is not true granite, being hornblendic and syenitic. Much of it is used for road material, such as macadam, setts and kerbs, and practically none is used for architectural purposes.

Ireland possesses several fine deposits of granite, but unfortunately until the last few years no proper attempts have been made to work the material. Perhaps the best deposits are to be found in Galway.

"STANDARD GREY" GRANITE QUARRY, BAKKE, NORWAY.

Quarrying Methods.

The masses of granite rock are in all quarries found to be separated by joints or cracks. The jointing is generally somewhat regular, and is due to the fact that the rock in process of formation has been subjected to forces which have slid one portion upon the other, so dividing the rock with vertical and horizontal joints. It is these joints which allow the extremely hard material to be quarried and worked economically. The Aberdeenshire granites are not so regular in jointing as the granites of Cornwall, and the latter therefore possess a slight advantage over the former in this respect, though other conditions have led to their occupying a subsidiary place. The granites of Norway, in particular, are possessed of extremely regular beds, and they are at the same time, as we have before noted, in a very advantageous position as regards transport.

The blocks of granite are dislodged from their natural position by blasting. The explosive used depends upon the purpose for which the granite is being quarried. If regular blocks are not desired because the material is required for road metal, a high explosive, such as dynamite, is adopted. When, however, blocks of good size are required for architectural purposes the blasting explosive is of a milder form, such as powder or special explosives, of which there are several on the market. The holes for the explosive are bored by drills of various kinds. It was formerly the practice to do the drilling by hand, one man holding a steel bar with a cutting edge, which he moved round in the hole as two other men struck upon its head with sledge-hammers. Now-

MASONS' SHEDS, BAKKE QUARRY

adays mechanically driven drills are used. The explosive is rammed in the hole or holes and exploded either by means of fuses or electricity.

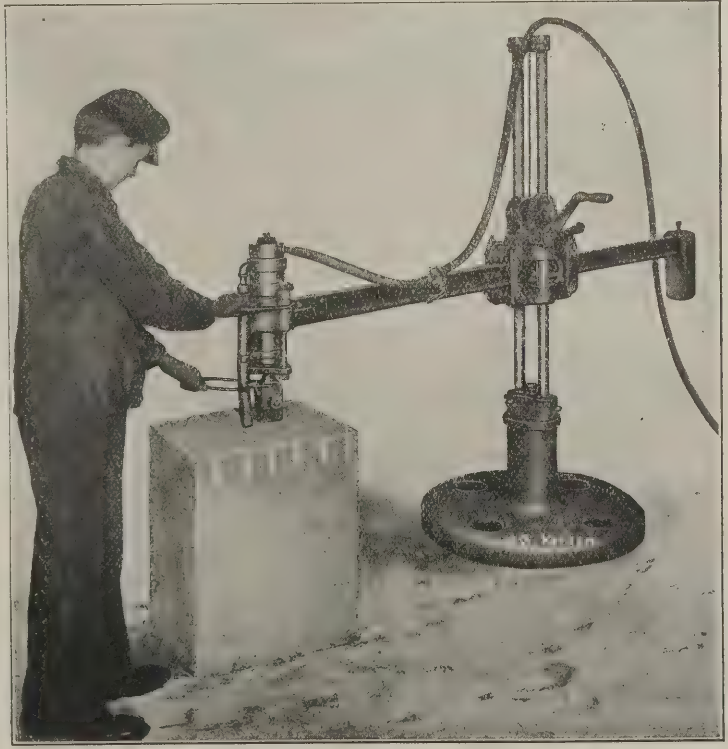
In quarrying granite the first process is to get at the granite. In some quarries there is a layer of other material, sometimes of considerable thickness, over the granite. This over-burden is chiefly composed of weathered or disintegrated granite. In the quarries of Aberdeen the over-burden is costly to remove and the top rock unremunerative. The main principle therefore underlying the development of the Aberdeenshire quarries is to work downwards. The way in which this is done is shown in the view on p. 425 of the working face in the Sclattie quarry, owned by Messrs. A. and F. Manuelle, the well-known granite merchants.

Some of the quarries in Norway have been naturally gifted with a small amount of over-burden, so that they are economically worked from the very start. No great amount of labour has been necessary to get at the granite, it being possible to find good-quality material almost immediately it was contemplated opening up a certain deposit of granite. The result is that in some of the Norwegian quarries there has been no necessity to expend much capital in making the material available, and thus economy has resulted, for material can be put upon the market without expenses in the way of paying interest on capital sunk in the venture. We give herewith some photographic views of the Norwegian quarries of Messrs. A. and F. Manuelle at Bakke: in which it will be noticed that rock of excellent quality, sound, fine-grained, even in texture and colour and in large masses is found direct upon the surface with practically no over-burden at all—lying, too, right upon the shores of the fjord, it being possible to lift the blocks by cranes, to run them into a yard only a few feet away, and thence to run the crane with a worked block just a few yards further and lift it into the hold of a ship. Is it to be wondered at that, when such natural facilities exist, Norwegian granite has come so much to the front of late?

FINISHED BLOCKS OF "STANDARD GREY" GRANITE, BAKKE, FOR "MORNING POST" BUILDING, LONDON.

While it is necessary in the Aberdeen quarries to quarry downwards it is not so necessary in other quarries, as, for instance, these quarries in Norway. It is not also always necessary to blast out the rock. Sometimes a series of holes can be bored and blocks removed by splitting with wedges and feathers.

A detailed description of quarrying methods in the Aberdeenshire quarries was given in our issue for August 21st last. It is unnecessary for us to repeat it here.



"KOTTON" JUNIOR SURFACER FOR GRANITE.

The drills are worked by steam or compressed air, as a rule, though electrically driven drills have also been tried. When there are no natural bedding joints the holes have to be drilled so as to separate blocks in a horizontal plane. These are known as breast drills, but it is very often possible to do without them, with resultant economy.

Various forms of cranes are used in the Aberdeen quarries. Cable-ways are used and hoists for lifting the material from the bottom of the quarry pit to the top, while all-round jib cranes sustained by guys are used upon the floor for lifting blocks. Sometimes, in place of the latter, locomotive cranes, i.e., running on wheels, are adopted.

In American quarries derricks or cranes similar to those in Aberdeen (which indeed are often called the American type of derrick) are used; whereas in the Norwegian quarry at Bakke it will be seen that steam locomotive cranes are found to be all that is required, because the quarry is not sunk, but carried in on the level.

Cutting and Dressing.

The stone having been removed from the working face by blasting, it is then split up into manageable blocks where it lies. Very large blocks are sometimes split by drilling holes and blasting with weak charges, but more often the large blocks are split into smaller blocks by means of plugs and feathers. This operation consists in drilling a number of holes about ⅝in. diameter, about 4ins. deep and about 5ins. apart. This is done by means of a "jumper"—a steel bar with cutting edges at the ends and a knob in the centre, which is repeatedly lifted up and dropped in a hole by the worker. In these holes are inserted feathers, which consist of thin pieces of steel rounded off on one side, two of which are inserted in the hole, and a steel wedge is driven in until it holds tight. These series of plugs and feathers range in lines, and the block is split by a quarryman giving each plug a few taps in succession with a hammer until the material rends. The block having been thus split into the approximate size, it is removed by the cranes to

the working yard and sheds, where it is dressed by various tools.

Tools with any hard material such as granite almost always conform to the nature of a punch with a sharp point. Some granite work is, of course, in the nature of rubble, the blocks being left with their natural faces, but the bulk of granite work is dressed, at least upon the beds and vertical internal faces of the stone. This dressing is performed by means of punches. The external surface is often left with a "natural face." If, however, it is required to have an even surface it is "punch" dressed. If a still finer dressing is required, it is picked, this operation being done with a small pick. A finer finish still is "axed" work, this operation being performed by means of what is known as a patent axe, a tool composed of a number of thin slips of steel tightly bound together with their edges all in the same plane and fastened to a handle. A final finish, namely polishing, may also be given.

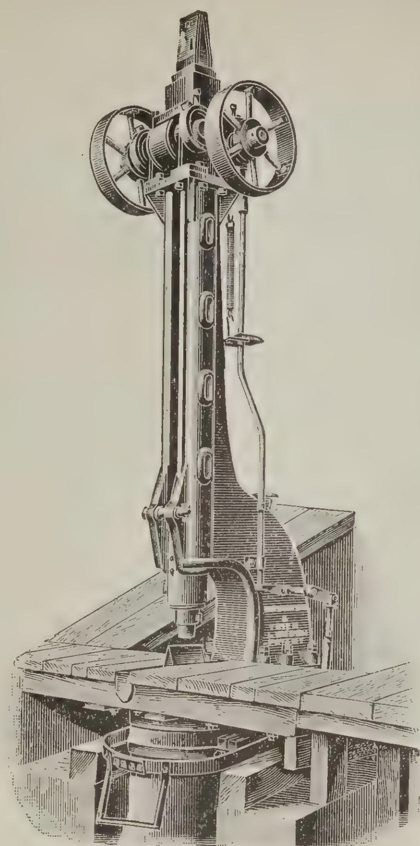
For the working of columns and other circular forms a turning lathe is used. The blocks before they are put in the lathe are roughly scabbled, *i.e.*, their corners are knocked off so as to dress the square block approximately circular. The cutters of the lathe consist of two circular cast steel discs which rotate on spindles while the block of granite is rotating, taking their motion therefrom

A universal granite dressing machine has not yet been invented, but pneumatic surfacers and pneumatic chisels, etc., are extensively used. The illustration on the preceding page shows a pneumatic surfacer, which quickly dresses off flat surfaces, and a pneumatic chisel: such chisels being found of great benefit for delicate mouldings, carving and lettering. The elaborate carving upon the "Morning Post" building was executed by pneumatic machinery.

Such methods have resulted in much economy over the old methods of working granite, and the result is that now elaborate details can be comparatively cheaply executed, notwithstanding the hardness of the material.

Polishing.

The polishing of granite is carried out in several ways. Rounded pieces, such as columns, are polished in a lathe which may be the same as that in which the block has been turned, although it is usual to use an ordinary lathe for the purpose. The polishers are cast iron curved blocks which lie on the surface of the granite. These are first used with an application of fine steel shot and water, whereby a fairly smooth surface is obtained. Succeeding this, emery and water are used to obtain a still finer surface.



SETT-MAKING MACHINE.

The metal blocks are then covered with thick felt and the final polish obtained by the application of putty powder.

The polishing of flat surfaces is carried out in another way, and there are some differences in detail. In all types of machines vertical spindles revolve over the top surface of the granite, communicating their motion to cast-iron rings lying on the surface of the granite, and perform the polishing with the aid of fine steel shot and water, succeeded by emery and water. Lastly, putty powder, in conjunction with pads of felt fastened on the cast-iron rings, gives the final polish. The differences in detail consist in the construction of these spindles and whether the granite surface remains stationary or not. In some machines the block of granite is placed in what is termed a wagon, which travels slowly to and fro on rails like the bed of a planing machine. The vertical spindles rotate flat cast-iron rings placed concentrically one within the other, but the axes of the spindles do not move. In other instances the blocks remain stationary and the frame with the revolving spindles and rings passes over them; this method is naturally more convenient in dealing with heavy blocks. Other machines again have both the granite and frame containing the spindles stationary, but the spindles and rings are moved over the surface by swivel-jointed arms, and there is a cam action in the frames which makes them travel eccentrically and polish the surface evenly all over.

The polishing of mouldings is done by means of "sliders," which consist of cast-iron blocks mounted upon a sliding arm operated by mechanical means. The blocks of iron are shaped out to the detail of the moulding, and fine steel shot, emery, etc., are used to give the polish.

Granite is occasionally sawn into slabs in the same way as marble by means of flat steel saws without teeth, several being fastened in a frame, the saw frame being suspended from above and moved backwards and forwards by machinery. Water and chilled iron shot are the materials which enable the saws to cut the material. Diamond saws have also been tried for cutting granite, and carborundum wheels for polishing, but they have not found general acceptance.

Sett-Making.

Of recent years machinery has been applied in the making of granite setts. The machine most in favour is a "drop-hammer" under the control of the operator's foot. The stones from the quarry are delivered upon the operator's table in handy blocks and the "drop-hammer" quickly converts them into well-shaped setts. One of these sett-making machines is illustrated on this page.

From the working of the larger blocks of granite in the quarry and also the manufacture of setts, considerable quantities of small rough pieces of granite are left. These are used for the manufacture of crushed or broken granite for road metalling, railway ballasting and the purposes of concrete aggregate. The stone is broken by machinery, as a rule, although a small amount is done by hand. The machinery either consists of gyratory crushers or stone-breakers that have a knapping motion which imitates the action of the hammer. The latter gives the best broken granite, because there is not so much powder produced, the material is not so crushed and broken, and it is also sharper than with gyratory crushers. For road purposes broken granite may not be so injured by being crushed, and the quantity of fine dust present is not so disadvantageous as it is for use in concrete work. In the latter, if the dust is very powdery it should be removed by washing, as otherwise it will reduce the strength of the concrete.

(To be concluded.)

WALTER H. BRIERLEY,

(Royal Acadc

B.A., F.S.A., ARCHITECT.
xhibition, 1908.)

May 20, 1908. Volume 28 No. 693.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

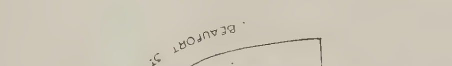
The Vienna Congress. The Eighth International Congress of Architects, which opened at Vienna on Monday, has the following subjects under discussion:—(1) The regulation of the cultivation of Art by the State, proposed to be effected by the establishment of special Departments for Fine Arts in every country, whose object shall be the promotion and care of Art in all its branches; (2) Architectural copyright and the ownership of drawings; (3) Regulations for international architectural competitions; (4) Legal qualifications and Government diplomas for architects; (5) The conservation of public architectural monuments; (6) Reinforced concrete buildings. It will be noticed that subjects 2, 3, 4, 5, and 6 have already done duty at the former Congress held in this country in July, 1906. We wonder what steps will be subsequently taken to give practical effect to the various resolutions which are, doubtless, now being moved and carried with the customary enthusiasm by our architect friends in Vienna? There are so many legitimate grievances ripe for redress in the profession that many architects are growing weary of academical discussions which merely serve as an excuse for a pleasant holiday.

Fashion in Architecture. Among the many remarks we have heard concerning modern architecture, we remember one to the effect that it possesses no general character of its own, and another which compared it with a collection of specimens of the art of bygone ages from which examples of the best masters are absent. If we are prepared to admit the justice of these criticisms it will be interesting to consider to what extent this unfortunate condition of affairs—primarily due, in our opinion, to the want of a properly coordinated and definite system of architectural education—has been brought about through circumstances not altogether under the control of architects, as, for example, by the mischief wrought by the constant changes in style which have been prevalent in the architecture of this country during the past forty or fifty years. Many of the older architects of the day can well remember the first studies in the "true" principles of Gothic architecture which, culminating in an enthusiastic appreciation of the works of W. Burges and E. W. Godwin, were subsequently ended by the rather abrupt transference of their fickle academical affections to the so-called "Queen Anne" or "free classic" style. However, it soon became evident that these comparatively innocuous diversions into the realms of architectural fantasy were merely preludes to a most reprehensible, and unduly protracted, *liaison* with a still earlier phase of the English Renaissance which is to be seen at its best in some of the collegiate buildings of Oxford and Cambridge. Unfortunately the pernicious effect of this untoward alliance is still writ large on the (miscalled) "monumental" work of our day, with the result that, with the possible exception of Mr. Belcher's Institute of Chartered Accountants, we can recall no modern effort in secular design that is likely to be regarded as an artistic achievement, say, some twenty or thirty years hence. We are aware that during recent years some efforts have been made to produce buildings of less meretricious, more scholarly, and more dignified character than those to which we were formerly accustomed, but, unhappily, the effect of a misspent youth, in which vitality was lost in an unfortunate dalliance with a vicious form of art, is still apparent in much of the architectural product of our time. So, having regard to the defective nature of their early training, and to the constant changes in architectural style which have occurred in the course of the career of many well-known men, it would be unreasonable, to expect architects of the day to show, by their designs, that they have thoroughly mastered the subtleties of any one style of architecture. In these circumstances the critic ought, perhaps, to view the examples of architecture produced by modern practitioners with feelings more nearly allied to sorrow than anger. Yet, if this may be fairly conceded, there still remains the fact that owing to the immense influence they possess among the junior members of the profession, successful architects occupy a position of grave responsibility with regard to the future welfare of that art to which, in season and out of season, they are so prone to assert their life-long devotion. What are they doing for the advancement of architecture, what for the education of the student of to-day who is destined to become the architect of tomorrow? In the absence of any properly organised systematic course of architectural education, students are, necessarily, largely thrown upon their own resources, and thus, in a measure, they have to educate themselves. Has the result in the case of the present generation of architects, many of whom were brought up in this haphazard manner of self-education, been sufficiently successful to warrant the continuation of the system in perpetuity? Are the sins of omission committed by these "men of light and learning"—the so-called "leaders of the profession"—really *equitably* compounded by annual addresses to students consisting, as a rule, of platitudes, of dogmatic assertions, sometimes even of such dangerous remarks as those to the effect that "architects are born not made," and that "tradition and scholarship fetter art"? We think not. Which of the "eminent" men of the time will have the courage to take the student into his confidence and warn him that the art of architecture is now in a state of decadence? Which of them will have the humility to say that to copy modern work is to court failure? Yet both statements are true.

The Vague Definition of an Architect's Responsibilities. At the recent annual meeting of the Royal Institute of British Architects convened to receive the report of the Council for the official year 1907-1908, Mr. George Hubbard drew attention to the fact, made clear by the perusal of clause 1 of the Schedule of Professional Practice as to the Charges of Architects, that the duties of an architect are, at present, so vaguely defined as to make it possible for him, in the event of the failure of the builder to carry out the terms of his contract, to be held directly liable by his employer for negligence in respect of certain matters or work over which he has little or no control. Rightly regarding the question of the definition of an architect's duties as one of supreme importance to all members of the profession, Mr. Hubbard thought that the council should consider whether the words in the schedule to which we have referred, namely, "the general superintendence of the works," are quite fair and reasonable to the architect, and he suggested that the latter's duties and responsibilities should be clearly laid down in the agreement (between the employer and the contractor) to relieve him from what, at present, appears to be an unlimited liability. The particular need for such definition was brought out in the recent action against an architect on account of dry rot which had made its appearance in a building some years after its completion, in which case the architect was held to be responsible. In the

course of the debate at the Institute one speaker assured the meeting (we are unable to state with what authority) that the question of the liability of architects was not "a matter that had been overlooked"; but that the architect undertook certain duties and the client could not punish him if he had used due diligence. Precisely, but assuming that, in the case of dry rot, the usual precautions as to ventilation are taken, what has the exercise, or want of exercise, of "due diligence" to do with the question of the architect's responsibility for dry rot? We have fairly good authority for saying that the germs of dry rot may be latent in a piece of timber that, to all external appearance, is perfectly sound and healthy, and, as such, has been allowed to be used. If this be so and yet dry rot makes its appearance a few years later, who should legally be held responsible—the builder, the clerk of works, or the architect? We heartily agree with Mr. Hubbard that what is required is an explicit statement on the subject defining exactly where the architect's liability ends.

New Crosby Hall, Chelsea. We illustrate on this page the scheme for the re-erection of Crosby Hall in conjunction with the new university hall or residential college for students of London University which is being formed at More House, Cheyne Walk, Chelsea. The plans have been drawn up by Messrs. Wratten and Godfrey with two main objects in view—first to place the Hall itself in such a manner as to reproduce as far as possible the original surroundings which it had in Bishopsgate, in the 15th century; and, secondly, to make it the central feature of a large collegiate group of buildings. To fulfil the first object, the hall is placed on the east side of a garden court, so that the row of windows which lately could not be seen from the outside will face Danvers Street, the opposite windows (including the oriel) being towards the garden. The oriel is in its original position, and the curious postern or side door be-



tween it and the return wall has been preserved. The whole is built over a basement (as in the original building), and the Hall is approached from a terrace on the garden side. The main entrance to the quadrangle is through a gateway in Cheyne Walk, passing under the students' rooms. It is proposed to build the new work in 2in. red brick with stone dressings, etc. The Hall will be faced with stone, as before, and all the old features will be used again in their correct relationship. In this way Crosby Hall would take its place once more as the centre of a large establishment of proportions not dissimilar to Sir John Crosby's original mansion, but in this case it would fulfil the same functions for a collegiate body which it formerly fulfilled for its private proprietors. It may be added that Mr. Godfrey has a very intimate knowledge of the original fabric, and the results of his research have been incorporated in the fine monograph on Crosby Place by Mr. Philip Norman which was published on Wednesday last.

Restoration Ethics. Now that the Trustees have put forward their appeal for funds to "restore" the nave of Iona Cathedral, the turmoil of argument has set in. For our own part, we are strongly opposed to the scheme, for the reasons expressed last week, and we do not at all "look forward confidently to a day, not distant, when the thousand visitors to Iona shall be gladdened by the spectacle of St. Columba's restored Cathedral," as Mr. Donald MacLeod, convener of the committee in charge of the matter, concludes his letter in the "Oban Times." "A Patriotic Scot," in a letter to the same newspaper, says:—"There are some people who find objections to the restoration of ancient buildings in any form. They like to gaze upon the picturesque ruins, and beg that these be left untouched by the hand of man, for their day at least. They prefer the destroying and disfiguring hand of time or weather, forgetting that but for timely act of preservation, such as the late Duke of Argyll carried out on the Iona ruins some thirty or forty years ago, the very ruins they cherish would not have remained for them to gaze upon to-day. But they also forget or overlook the selfishness involved in their request; for what we admire as picturesque to-day must, if left untouched in our day, be lost to future generations. But it is not a question for Mr. Champneys to decide whether the ancient cathedral is to be preserved or not; the facts remain for Scotsmen at home and abroad. The first fact is that shortly before his death the Duke of Argyll was assured by expert authority that in less than ten years the greater part of the beautiful ruins would succumb to the weather. Patching was

out of the question. The mullions and arches were crumbling. The carved pillars and doorways were being defaced beyond recognition, every year of exposure removing something of the priceless ornamentation. Preservation from the weather became urgent. This meant roofing, and roofing meant restoration. . . . And what "restoration" has resulted in is painfully apparent. As Mr. J. A. Campbell points out:— "All who care for the beautiful work of the past are agreed about the ugliness and incongruity of certain additions made by the restorers at Iona—the new pediment more especially, supported on one side by a nerveless dragon, and on the other by the angel 'with a vacuous smile.' If the dragon showed some feeble sign of energy, such as glows in the monsters vigorously carved on Knapdale tombstones, or in French cathedral porches, imagination might figure him bursting into life, tearing down the pediment, swallowing the angel (pious expression, harp, and all), and then making for his native deep. No such luck! He will remain till somebody who understands the genius of his own time in its relation to the earlier faith and art of Christendom comes along with an axe and a hammer. Seriously, how can the work of one man, if it embodies any of his character and individuality, be 'restored' by any other man, and how can the work of one age, wrought in the temper then prevailing, be 'restored' in any other age when a different temper prevails? And if a piece of work is not full of the character of the worker and of the time, is it anything but a disgrace and an eyesore?"

Our Library on Construction. Having received a letter from a subscriber who asks "how we in the provinces will obtain the books on construction" in the library which has been brought together at our new offices, Caxton House, Westminster, we think it desirable to clearly point out that there is no intention of making this a lending library. To do so would entail a great many difficulties, and, moreover, would detract greatly from the collection, for the reason that many books would be continually out on circulation, and, consequently, not available for immediate reference. We are particularly desirous of doing as much for our provincial subscribers as for those in London, but we fear in this case it is not practicable to do more than place the whole library at their disposal for reference when they happen to be in town, and (as we announced last week) to provide facilities for them to use the library room for any appointments which they may wish to make when in London.

Questions about Granite for Rosyth. In the opening of the session, until his relinquishment of office, the late Secretary to the Admiralty (Mr. Edmund Robertson) was bombarded with questions as to the intentions of the Admiralty regarding the choice of granite for the new docks at Rosyth. Mr. McKenna, the new First Lord, may expect a similar cross-examination at the hands of Scotch members. Already he has been questioned on the subject by Major Anstruther-Gray. Mr. McKenna, in reply, said the Admiralty were asking for alternative tenders, but no information could be given at present as to whether stone from home or foreign quarries would be used in the construction of the docks at Rosyth.

THE PRIOR'S HOUSE, MUCH WENLOCK, SALOP: WEST FRONT.

Views and Reviews.

A Monumental Work on Tudor Domestic Architecture.

The domestic architecture of the Tudor period offers such a wealth of material for illustration that we welcome the appearance of a monumental work on the subject, now published by Mr. Batsford. This work is the joint production of the late Mr. Thomas Garner and Mr. Arthur Stratton, the latter having carried it to completion subsequent to Mr. Garner's death. It is to be published in three parts, and, judging by the first part now before us, comprising 60 folio plates and text, will form a record of Tudor domestic architecture as adequate, as sumptuous, as that of the Earlier Renaissance in England by Mr. Gotch, and that of the Later Renaissance by Mr. Belcher and Mr. Macartney. The plates are large collotype reproductions of a series of excellent photographs, the majority of which have been specially taken, and they are accompanied in many instances by measured drawings which are of great value and interest. In addition, particulars are given of each of the houses illustrated, and distributed among the text are numerous plans, elevations, and sketches, as well as some excellent perspectives which have been specially set up for the purpose of this work. Prefacing the whole is a particularly well-written "Introduction." Here we find full cognizance taken of the many influences which moulded Tudor architecture. The period, strictly speaking, is that covered by the reigns of Henry VII. and of Henry VIII. and his three children, *i.e.*, from 1485 to 1603, but it can be very legitimately extended, because, of course, periods of architecture are not confined by the dates of accessions or deaths of reigning monarchs. Notice is taken in the "Introduction" of the great pomp and display of the court, which set an example of lavish expenditure that resulted in the erection of palaces like Hampton Court and Non-

THORNBURY CASTLE, GLOUCESTERSHIRE: PART OF SOUTH FRONT.
("*The Domestic Architecture of England during the Tudor Period.*")

such, and large and costly houses such as Layer Marney and Sutton Place. This was particularly the case after the suppression of the monasteries, which, it is estimated, brought nearly fifteen millions of money into the King's purse, enabling "a large number of the new class of courtiers and sycophants to build country houses for their own use on varying scales." There was also the great remodelling carried out by the new aristocracy at the manor-houses of their forefathers, as at Haddon Hall, while another powerful influence was the revival of letters. All these various phases are well represented in the work under review.

We give on the preceding page two reductions from the plates—the Prior's House at Much Wenlock, which illustrates the Tudor just emerging out of the Gothic period, and Thornburn Castle, a fragment of what must have been a truly magnificent house of the Tudor period, embellished with some particularly fine windows and chimney stacks. In the majority of these Tudor houses one cannot fail to take special notice of the chimney stacks, which constitute such a prominent feature of the exterior, and remain to this day as delightful examples of brickwork detail.

The work is a thoroughly worthy record of the period, and should meet with wide appreciation.

The price to subscribers will be two guineas per part, but on completion this price will be raised. Parts 2 and 3 are in active preparation, and the work will be completed early in 1909.

"The Domestic Architecture of England during the Tudor Period," by Thomas Garner and Arthur Stratton, A.R.I.B.A. London: B. T. Batsford, 94, High Holborn, W.C.—Part I.

The Charm of the English Village.

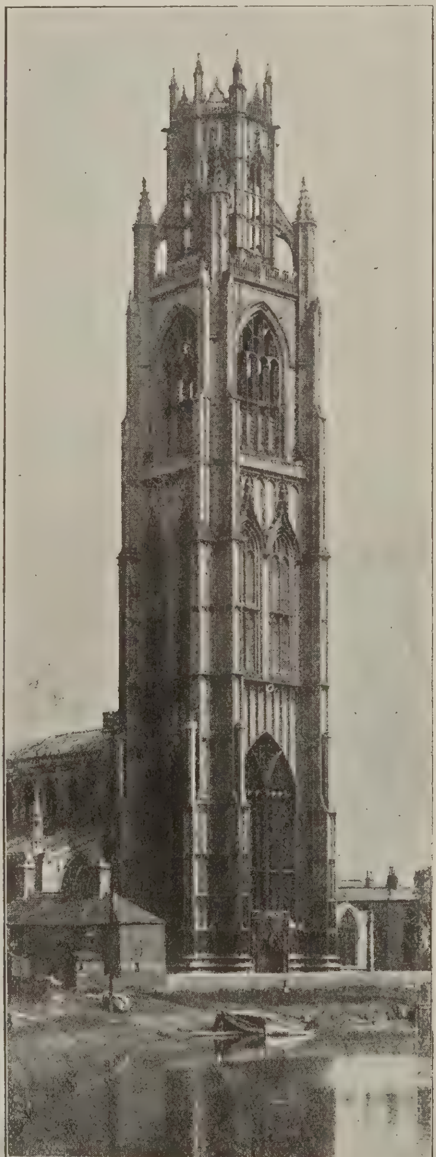
A much less experienced topographer than Mr. Ditchfield, and a much less skilful draughtsman than Mr. Sydney R. Jones, could hardly have failed to produce an attractive book upon a subject so happily chosen, and so richly fraught with inherent charm. The writer, it is true, has but little distinction of style. He plods along in a plain pedestrian way; but his matter-of-fact method is less trying to the nerves than the average gush of the guide-book. The author realises that semi-historical gossip is better than semi-hysterical flourish. With the aid of his artist he shows us what we are delighted to see, and describes it with a merciful abstention from wearisome insistence on the obvious—a virtue not too common in books of this class. The work of the artist is chastened with like restraint. He seems to have avoided instinctively—or perhaps, under the guidance of his collaborator—the more familiar show-places, the too-effective bits, that the picture post-card has vulgarised, and in most instances he has chosen to sketch, instead of the more blatantly aggressive types of rustic beauty, such examples as commend themselves by a more modest appeal to a better educated taste. He has, in fact, caught the real spirit and the true charm of the English village, and has rendered these by sketches that show considerable vigour and breadth of treatment.

Both author and artist have given due attention to all the characteristic features of the village—its church, its manors, farms, and rectories (for these buildings, although they cannot always be said to form an integral part of the village, are seldom very remote from it, and could not, in any case, have been properly excluded): its cottages (of as many types as localities); the constructional and decorative details peculiar to various inns, shops, and mills; almshouses and grammar-schools; village crosses and greens; barns and dovecotes; roads, bridges, and rivers; and even sundials and weathercocks. The survey, therefore, though necessarily casual and arbitrary as to the choice of examples, is, at all events, complete as to types and characteristics; and the almost absolute freedom of choice exercised by the author has enabled him to avoid altogether the redundancy inseparable from a formal and systematic itinerary: and the result is a most delightful book.

"The Charm of the English Village," by P. H. Ditchfield, with sketches by Sydney R. Jones. London: B. T. Batsford. Price 7s. 6d. net.

BOSTON STUMP STRUCK BY LIGHTNING.

The thunderstorm that visited the Eastern Counties last Wednesday struck Boston Stump, the famous tower of the beautiful church of St. Botolph. One of the pinnacles of the tower was dislodged, and about half a ton of the masonry crashed through the roof of the belfry. St. Botolph's, Boston, is the largest parish church in the kingdom. Its tower, which is always known as the "Stump," is 288 ft. high: it somewhat resembles that of Antwerp Cathedral. It has been twice previously struck by lightning.



BOSTON "STUMP," LINCOLNSHIRE, WHICH WAS STRUCK BY LIGHTNING LAST WEEK.

R.I.B.A.

Prof. Beresford Pite on "London Bridges."

A meeting of the Royal Institute of British Architects was held on Monday evening, when Professor Beresford Pite, F.R.I.B.A., read a paper on "London Bridges," illustrated with lantern views.

Prof. Pite said that London had at least 21 bridges over the Thames, counting from the Tower to Hammersmith, 14 of them being public road bridges and seven used for railways. All had been erected within the compass of a century, beginning with the commencement of that now named Waterloo in 1811, and concluding with the opening of Vauxhall in 1906. The railway bridges all came within the latter half of the century, commencing with Charing Cross in 1860, and ending with Putney Railway Bridge, which was opened in 1889.

To the final quarter of the 18th century and the first quarter of the nineteenth belonged Waterloo Bridge and London Bridge, each of colossal magnitude, witnessing to a purity of taste, refinement of architectural knowledge, and power of constructive skill in achievement to which England had not heretofore attained.

At the beginning of the nineteenth century additional bridge accommodation was a recognised necessity, for we find that, besides the two great stone bridges just alluded to, the advent of iron as a practical material was early witnessed by its adoption in the erection of Vauxhall and Southwark Bridges, the former occupying from 1811 to 1816 and the latter from 1814 to 1819. Thus three new bridges were in course of erection overlapping one another. The three old bridges of Westminster, Blackfriars, and London were thus doubled before the rebuilding of the last-named was undertaken; four bridges being thrown over the river in the twenty years which elapsed between the commencement of Waterloo and Vauxhall in 1811 and the completion of London Bridge in 1831.

A rest of twenty years then ensued, and another period of bridge-building begins. Again a similar span of twenty years, which includes the erection of six bridges, embracing the rebuilding of two and the addition of four new bridges above the former limit of London extension. It begins with the rebuilding of Westminster from 1854 to 1862, and includes the erection of Chelsea Suspension Bridge, opened in 1858, and Lambeth (also suspension) in 1862, then the rebuilding of Blackfriars from 1864 to 1869, the Albert Bridge, in hand from 1863 to 1873, and Wandsworth Bridge, opened also in the latter year. All the six thus named in this second epoch of twenty years, like the first series, are road traffic bridges, but none wholly of masonry.

During this second era of bridge-building, and entirely covered by the decade of the sixties, we have also a group of five railway bridges.

Then follows another group of road bridges beginning with the third, alas! only of masonry—the finely simple public bridge at Putney, commenced in 1883 and opened in 1886: Hammersmith Bridge, rebuilt in 1887; Battersea in 1890; then the most significant of the whole series, the bascule bridge at the Tower, like all important achievements the child of heated controversy in 1894. Then a cessation until the rebuilding of Vauxhall Bridge.

A discussion followed, in which Mr. H. H. Statham and Mr. W. E. Riley took part, Professor Pite replying.

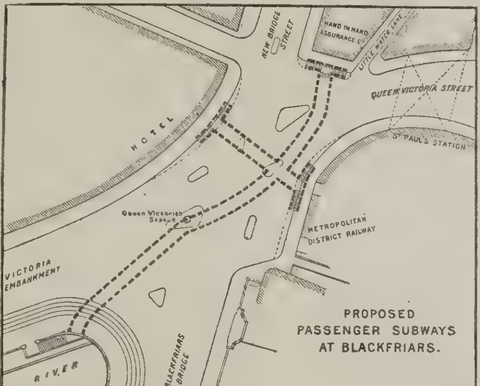
SOUND-PROOF PARTITIONS.

Some Interesting Tests.

Referring to the enquiry about sound-proof movable partitions for schools which appeared in our issue for last week, Messrs. Arthur L. Gibson and Co., of 19-21, Tower Street, Upper St. Martin's Lane, W.C., write pointing out the value of "Cabot's Insulating Quilt" for such purposes, though they agree with the opinion we gave that, under the conditions formulated, it would be impossible to guarantee that the singing of 80 children in one class-room should not be heard in the next. In this connection we find some interesting particulars in a booklet on some sound-deadening tests for the dormitories of the New England Conservatory of Music. These tests were carried out a year or so ago under the direction of Prof. Charles L. Norton, of the Massachusetts Institute of Technology. On the fifth floor of a warehouse five rooms were partitioned off, each 7ft. square. The floor was of two thicknesses of boards, with two thicknesses of "Cabot's Sheathing Quilt" between the floor boards and the concrete slab of the main floor. The ceiling was the under side of the concrete floor above. On one side of each room was a glass-panelled door, the jambs being felt-lined and the bottom fitted with a "weather-strip" which made a tight joint. Room A was submitted by the National Fireproofing Co., and its walls were formed with terra-cotta blocks (front and back 4ins. thick, sides 2¾ins. thick), plastered with two coats, inside and out. Room B was submitted by the Keystone Block Co., its walls being formed with "Keystone" blocks (of the nature of plaster of Paris, with a fibrous bond), front 4ins. thick, back 3ins., one side 2ins. and the other side having two 2in. blocks with a 2in. air-space between them; plastered inside and out. Room C was submitted by the Sackett Wall Board Co., its walls being formed with Sackett plaster board (alternate layers of paper and plaster), ¼in. thick, wired on both sides of 3in. steel channels, wrapped around with felt; also plastered inside and out. Room D was submitted by J. Russell and Co., one side being formed of metallic lath and plaster finishing 2ins. thick solid, another side formed of metallic lath on ⅞in. studs, with two thicknesses of waterpoof paper, having a layer of ⅛in. felt between, and plastered with two coats; the rear wall of similar construction, but with only one thickness of waterproof paper, and no felt; and the front wall of metal lath on two rows of staggered studs, with "Cabot's Seaweed Quilt" between. Room E was submitted by Mr. Samuel Cabot, its walls being formed with metal lath and plaster double partitions, with the space between filled with "Cabot's Sheathing Quilt," there being three thicknesses of quilt on two walls and two thicknesses on the remaining two. A piano, violin, cornet, and the human voice were tried in the five rooms, and a felt-mouthed stethoscope was tried on the outside of each partition, in order to catch whatever sounds came through. The insulating property of some of the partitions was so good that not even the blare of the cornet could be heard outside. After much consideration Professor Norton placed Room E, insulated with "Cabot's Quilt," as being the most efficient, and this material he recommended for the rooms of the New England Conservatory of Music, for which the tests were made.

SUBWAYS FOR DANGEROUS STREET CROSSINGS.

Without doubt the intersection of roads at the City end of Blackfriars Bridge forms the most dangerous crossing, or collection of crossings, in London. Several other danger-spots are sufficiently bad to suggest rivalry in that bad eminence, notably at the junction of Gray's Inn Road and Theobalds and Clerkenwell Roads, about which a memorial has been presented to Holborn Borough Council, imploring some means of relief from the frequent and frightful accidents there; but its only formidable competitor—the very congested area between the Mansion House, Cheapside, and Cornhill—has been rendered comparatively inoffensive by the construction of subways. There can be no doubt that the subways already constructed have justified their existence. They are the means of preventing waste of life, if not of time. Although to go down one flight of steps, along a passage, and up another flight, is necessarily a tedious method of getting across a road, it is, in the extraordinary circumstances of these congested crossings, often the quickest way, and is incomparably the safest. It is stated



PROPOSED PASSENGER SUBWAYS AT BLACKFRIARS.

that the City man seldom uses the Mansion House subway; he prefers speed to safety, and takes his chances in dodging the traffic. But the City man's life is usually insured prettily heavily! The subways of which a sketch plan is here shown (reduced from a diagram given in the "Daily Telegraph") will provide a safe means of crossing between the north-west corner of Blackfriars Bridge and Queen Victoria Street, or between the pathway in front of the District Railway Station to the east, and that in front of De Keyser's Royal Hotel to the west. The intervening roadways between some of these points are, both in appearance and in actuality, so dangerous that nervous or infirm persons quite commonly make long detours in order to avoid the risk. In such cases the subway is actually a time-saver. The main subway at Blackfriars will be more than 100 yds. in length, and the width for this and for the shorter spurs will be 10 ft., while the general height will be 8 ft. The stairways will be 5 ft. wide. The plans have been prepared by Mr. Basil Mott, the City Corporation's consulting engineer, and it is expected that the actual work of construction will be begun very shortly. The cost, which is not to exceed £30,000, is to be defrayed by the London County Council, but the work is to be executed or directed by the City Corporation. It is urged that a subway between St. Paul's Railway Station and Water Lane (underneath Queen Victoria Street) is required almost as urgently as the subways that, as the plan shows, are to be formed 200 yds. or so further westward. If these latter demonstrate conclusively the utility of the system, many more subways will follow.

NOTES FROM LIVERPOOL.

On May 11th Lord Stanley of Alderley laid the foundation-stone of the new head offices for the Royal Liver Friendly Society at the Pierhead, Liverpool. The building is designed in a "free treatment" of English Renaissance, and will cover an area of about 1¼ acres, with a frontage of 290ft. to Water Street and 170ft. to the river Mersey. The height of the building, as approved by the City Council, is to be 146 ft., measured from the pavement to the top of the main cornice, while the two towers at the west and east ends will rise to a height of nearly 300 ft. There will be ten storeys. This great height is in one respect to be regretted, as it will completely dwarf the magnificent offices of the Mersey Docks and Harbour Board which adjoin, and which form unquestionably the finest modern building in Liverpool. The new Liver office block will be of steel construction faced with grey Scottish granite. Internally, light will be supplied from three large areas, and the various floors will be reached by means of a dozen lifts. It is expected that the Royal Liver Society will require about a quarter of the total accommodation for its own use; the remaining space will be let in suites of offices, and there is a probability that some of the leading shipping firms will be housed within the building. The estimated cost of the structure is about £250,000. The architect is Mr. Aubrey Thomas, of Liverpool.

The first portion of Liverpool Cathedral to be finished will include the Lady chapel, vestries, choir, and a portion of the cross transepts, providing a church 200 ft. long, 86 ft. wide, with 2,000 seats. Subscriptions have been promised to the amount of £266,412. Up to December 31st last the Committee had expended the following:—

Purchase of site and legal and general expenses	£28,331
Construction of foundations	42,309
Contractors	28,251

leaving in hand for the erection of the rest of the fabric £141,000. It is estimated that the remainder of the work proposed to be done will cost £232,000, so that about £70,000 is still required.

Mr. W. P. Hartley, the well-known Liverpool jam manufacturer and Free Churchman, has made an offer to purchase Holborn Town Hall (including the organ, fixtures, and furniture) for £31,000, with the object of providing the Primitive Methodists with a suitable church house. The town hall was built in 1879-80, and a total of £60,000 has been spent on it. It is Mr. Hartley's intention to spend several thousand pounds in erecting a building in the courtyard as a book distribution centre.

Although there still remain some big areas to be dealt with, the old slums of Liverpool are fast disappearing. Dr. Hope, the medical officer of health for the city, states in his report, just issued, that during the years 1906-07 the number of insanitary dwellings dealt with by the Corporation was 1,078, of which 454 were demolished, 325 closed and awaiting demolition or reconstruction, and 297 reconstructed and rendered sanitary.

Notes and News.

A GYNÆCOLOGICAL THEATRE is to be added to Cardiff Infirmary.

* * *

NOTICE OF REMOVAL.—The City of London and Finsbury Drawing and Tracing Offices have been removed to No. 63, Finsbury Pavement (third floor).

* * *

THE 1,000th ISSUE OF "WORK," the penny illustrated weekly journal of handicrafts, has been reached with the issue dated May 16th, published last week.

* * *

MESSRS. HOMAN AND RODGERS, of Manchester, have supplied and fixed the constructional steelwork and have laid the concrete and steel asphalt flats at the New County Buildings, Colwyn Bay.

* * *

AN EXHIBIT OF BURLINGTON SLATE WORK, carried out in various qualities, sizes and colours, can now be seen at the London offices of the Burlington Slate Quarries (Kirby-in-Furness, North Lancashire) at Dartmouth Hall, Queen Anne's Gate, Westminster (within two minutes of St. James's Park station).

* * *

TO IMPROVE THE MEANS OF EXIT FROM L.C.C. SCHOOLS, the Buildings and Attendance Sub-Committee of the London County Council Education Committee have decided that the bolted portions of certain of the existing doors which now open inwards shall be made to open outwards. The cost of the work is estimated at £1,500.

* * *

THE SHEFFIELD BUILDERS' CONCILIATION BOARD held its annual meeting last Wednesday at the Building Trades' Exchange, Sheffield, when Mr. A. J. Forsdike was re-elected president for the ensuing year, with Mr. F. Limage, of the Bricklayers' Society, as vice-president; while Mr. Thomas Smith (employers) and Mr. T. Driver (operatives) were elected joint secretaries. It was resolved unanimously that the shorter working days, or "winter time," should begin and end one week earlier than heretofore, beginning on October 24th, instead of on November 1st, and ending on February 6th, instead of February 13th. The proposal to adopt a uniform holiday week in the summer was recommended to the consideration of the operatives' society.

* * *

MESSRS. D. G. SOMERVILLE AND CO., reinforced concrete specialists, have at present in hand a large amount of work at the Franco-British Exhibition. The most important of this consists of a large model bakery for Messrs. McVitie and Price. The whole of this building, which represents a Scotch manor-house, is constructed in steel framing and reinforced concrete. The above firm have also secured the contract for steelwork and reinforced concrete for a very large telephone exchange at Deptford (Mr. Leonard Stokes, F.R.I.B.A., architect), and they have further in hand the whole of the structural steelwork required for the new Carnegie library at Dundee, structural steelwork for Sir William Treloar's home for crippled children at Alton, Hants, and steelwork for the new Holloway Sanatorium at Virginia Water.

Our Plate.

"Purse Caundle," Milborne Port, Dorsetshire.

This house, with stabling and cottages, is in course of erection for the Hon. Mrs. Alfred Ker, of Ven, Dorset, on a fine site about two miles from Milborne Port Station. The walls are of local flat-bedded limestone, and Doulting stone dressings. The roofs are to be of rich red hand-made tiles, and the chimney stacks of thin red hand-made bricks. There will be sash windows with stone architraves, sills, and cornices, and green painted shutters on the east front. It is intended to panel the hall and dining-room in walnut, and the drawing-room in pine, painted white. The general contractors are Messrs. J. Parnell and Sons, of Rugby, and the architect is Mr. Walter H. Brierley, F.S.A., of York.

Obituary.

MR. HERBERT DAVIS, F.R.I.B.A., a past president of the York and Yorkshire Architectural Society, died on Wednesday last. He was only 37 years of age, and his death thus early will cause profound regret amongst his architectural colleagues.

WORKMEN'S COMPENSATION INSURANCE.

Insurance against accidents being absolutely necessary in order that builders and contractors may face with comparative equanimity the heavy responsibilities imposed upon them by the Workmen's Compensation Act, the only open question with respect to this important matter is, With what company or corporation can insurance be effected upon the best and most equitable terms? While this class of insurance was still very new the competition for it was remarkably keen. Then a strong reaction set in, several of the companies appearing suddenly to realise the obvious advantages of combination over competition for keeping up rates. The attitude they then assumed led employing builders—who may be trusted to understand quite clearly in whose interest such combinations are likely to operate—to consider the desirability of taking their own insurance business into their own hands, rather than submit to the high rates that then became prevalent. We are informed in this connection that the General Accident Company, of Perth, has absolutely refused to enter the combine; and as this company is old-established and of high standing, it is no doubt justly regarded by the combine as a very formidable competitor. The General Accident Company, having had more than twenty years' experience of underwriting accident assurance, has ascertained that it can rate its insurance on equitable terms without reference to the Tariff, and at the same time to the manifest advantage of its clients. The General Accident Company points to its possession of more than a million pounds sterling of assets as offering the fullest security for its policyholders; and it claims that its experience of the business and its system of organisation render it independent of arbitrary standards of rating. During the year ended December 31st, 1907—six months only of which were under the new Act—the company placed considerably more than £200,000 worth of Workmen's Compensation business on its books, at rates that, in the majority of cases, were considerably lower than those of the Tariff.

Notes on Competitions.

A Two-Guinea Competition.

The Building Committee of the English church at Gorseinon invite competitive designs for a "new plain church, with tower, to accommodate 600 persons," and they offer two guineas for "the best plan in the Committee's judgment." *Two guineas* and no assessor, and the architect to state "estimated cost of such church, terms of commission, including bills of quantities"!

Intermediate School for Boys, Cardiff.

At last week's meeting of the Cardiff City Council, Alderman Trounce moved that the decision of the Council fixing the cost of the new intermediate boys' school at not exceeding £10,000 be revoked, and that the Education Committee be authorised to increase the cost to not exceeding £12,000. He said they had found it impossible to get the work carried out at the first-named sum. Councillor Caple seconded, pointing out that since the £10,000 had been sanctioned the accommodation of the new building had been very largely increased. Councillor Morgan Thomas opposed the resolution, saying he not only questioned the necessity of spending £12,000 on the school, but also whether a new intermediate school was required at all. Alderman Lewis Morgan protested against such a suggestion going out to the public. No member of the Council would like to work under the conditions the boys had in the intermediate school. The motion was carried.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
May 20	SCHOOL AT BRIDLINGTON.—Limited to local architects. No premium. Particulars from G. G. O. Sutcliffe, Quay Road, Bridlington.
May 23	SECONDARY SCHOOL AT TIVERTON (to cost £6,000).—Premiums of 50 and 25 guineas. Conditions from E. S. Perkin, Director, Middle Schools and School of Art, Tiverton, Devon.
May 30	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall, Eccles, Lancs.
May 31	EMERGENCY HOSPITAL AT ILFORD.—Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
June 6	SECONDARY DAY SCHOOL SHREWSBURY (70 Boys and 70 Girls).—Conditions from W. H. Pendlebury, Secretary, Higher Education Committee, Shire Hall, Shrewsbury.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Particulars in BUILDERS' JOURNAL, April 29th. Conditions from the Secrétariat de l'Association du Monument de la Réformation. 56, Rue du Stand, Geneva.
1909. Jan. 1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date: final competition to be limited to six competitors.
No date.	COUNCIL SCHOOLS AT NANTWICH.—Particulars from C. E. Speakman, Clerk, Education Offices, Crewe.
No date.	PARISH CHURCH AT BISHOPSWEARMOUTH.—Limited to Sunderland architects. Conditions from H. E. Hinckley, 68, Cleveland Road, Sunderland. Deposit one guinea.

CONCRETE AND STEEL SECTION.

(MONTHLY.)

Aggregates for Concrete.

It is surprising how many materials are available for use as aggregates in the making of concrete. The following may be considered as embracing, roughly, the majority of materials ordinarily used:—Coke-breeze, cinders and clinker, broken brick, burnt ballast, broken sandstone, broken limestone, broken flints, waterworn pebbles, shingle, crushed granite and similar igneous rocks, pumice, flints, slag, etc. The selection of the aggregate, therefore, for any particular job requires careful consideration. All these aggregates are capable of being used with advantage in certain circumstances. In most cases it is the question of economy which chiefly determines the matter. Some aggregates, of course, provide concretes which are superior to others, but their cost in certain localities is prohibitive; a few special classes of work also preclude the use of some aggregates; but, as a general rule, it may be held that the whole of the aggregates enumerated can be used both in the manufacture of plain and reinforced concrete. Some of the aggregates, however, are porous, and require special treatment to limit this porosity, or to guard against ill-effects resulting therefrom. To take these precautions may be worth while in some instances, but in others the prime factor of cost leads us to put them on one side. The making of concrete, notwithstanding the great mass of information that has been published by those who have had much experience and by those who have had little or none, is still very unscientific in the majority of cases. Even among those who have a great deal of practice a policy of *laissez faire* is often adopted, though it must be admitted that insufficient experimental work has been conducted, and, consequently, practice must, to a large extent, be rule-of-thumb. For instance, the proportions of concrete necessary in order to eliminate the voids and produce the greatest compactness that affords a concrete of greatest strength are often guessed at, and seldom determined, though it is easy to do so. The mixing, too, is often imperfectly performed, though, now that concrete mixers are coming into more general adoption, great improvements have been made in this direction. The manufacture of Portland cement is much superior to what it was a few years ago, and the bulk of the cement on the market is now of very high standard. Bad results are chiefly attributable to other causes than bad cement. It is a fact that to use concrete properly requires some amount of specialist knowledge, though the rank and file of the building trade seem to think that anything will do for concrete. How this idea became so prevalent it is difficult to determine. We think it is partly attributable to the efforts of enthusiastic and ignorant early inventors who advocated concrete for any and every purpose before cement was reliable, and before the manufacture of good-quality concrete was understood. The opposition displayed by the by-laws to the use of concrete dates from this period, and certainly the concrete of that date, as put into walls constructed *in situ* was weaker than good brickwork, so that the requirement that walls of concrete should be one-third thicker than brick walls was not a useless provision without any reason behind it. But to-day this is an absurd restriction, provided that the concrete work is well done. We still see builders, however, putting very poor quality concrete into foundations of buildings. If the builders, the owners and the architects could be made to realise that a little more care employed in the manufacture and in proper scientific study would enable stronger and much more economical foundations to be built, we should see an improvement effected very quickly. Fortunately, the progress in the application of reinforced concrete is educating builders and others to treat concrete with more respect, and to realise that there is a little more in the subject than they are accustomed to think.

Obstacles to Progress.

In the Engineering Supplement of "The Times" recently an article appeared referring in strong terms to the obstacles put in the way of the adoption of reinforced concrete by the by-laws and regulations of authorities, including the absurd regulation of the Local Government Board that loans for such construction would only be granted for a brief period of 15 years, whereas 30 years is customary for structures erected of the ordinary type, which are really less durable, and by no means so safe as reinforced concrete. The writer of the article called attention to the new extension for the General Post Office being erected in reinforced concrete which comprises structural features that would be impossible or impracticable in ordinary steel or masonry, if it were not that Government buildings are exempt from the stipulations of the London Building Act. A frame construction is adopted throughout, with thin panels only of such thickness as is necessary for a protection against the weather. A saving of 20 per cent., it is stated, is being effected by the adoption of reinforced concrete. The article proceeds:—

"There is really no reason why the privilege of making so large a proportionate saving should be confined to His Majesty's Government and railway companies, which also are exempt from harassing building regulations. All antiquated enactments and rules of the sort obviously require amendment at the first opportunity, but as all reforms are lamentably slow of realisation in this essentially conservative country, it is highly desirable that those authorities who have power to make exceptions should be ready to grant relief to those desiring to employ modern systems of construction. The London County Council have recently recognised the justice of this view by sanctioning the construction in the South of London of some large granary buildings in reinforced concrete, where the walls and structural features generally will be proportioned in accordance with engineering principles regardless of the provisions of the London Building Act. It is understood that these buildings are the first commercial structures of their class hitherto sanctioned in the metropolis as 'special buildings' exempt from the ordinary regulations, but it is to be hoped that they may be followed by many others in due course. A similarly praiseworthy instance of enlightened policy is afforded by the decision of the Liverpool Corporation to permit the erection of the new office building of the Royal Liver Assurance Co. on economical lines. This building, designed throughout in reinforced concrete, will occupy a commanding island site opposite the Prince's landing stage, and, rising to the height of some 300 ft. above road level, will constitute an excellent example of what can be done with reinforced concrete if only fair treatment be accorded to the new material and method of construction."

This only represents a view which we have expressed on several occasions before in these columns, but we are glad to see an influential member of the daily press emphasising the subject. It is time that some remedy was effected, because the loss to the community caused everywhere throughout the country by the foolish policy of fogeys trained in the old school, and the lassitude displayed by public authorities in delaying the overhauling and revision of by-laws, is enormous. Much money is being wasted in building construction without any increase in efficiency. Though we in this country were the first in the field with the invention of reinforced concrete, it remained for other nations to develop the subject, and now we are still shamefully behindhand. The local authorities throughout the country want waking up, and our architectural and engineering societies could not do better than use all their efforts for a time to endeavour to effect reform in such matters. Both reinforced concrete and steel-frame construction, as well as many other new methods and materials in building construction, should be used to the fullest advantage. The London Building Act, in particular, requires revision, though that authority recognises its regulations are out of date, and wishes to adopt more reasonable by-laws, evidence of which is offered by Messrs. Seth-Smith and Morris, in a letter referring to the above-mentioned article, in which they state they are erecting a factory in the West district in which they have obtained the consent of the London County Council to construct all its external walls, not in reinforced concrete, but of steel-frame construction filled in with brickwork of uniform thickness, sufficient to exclude damp from the basement to the fourth floor.

Centering.

One of the greatest expenses in the construction of reinforced concrete work is in connection with the centering, known under the general term of "forms." A good deal of waste occurs in the timber, but the labour is the most serious item. Occasionally the timber can be used over and over again in buildings where there are several floors of similar design, but in the majority of cases very few forms work-in again. The boards and strutting can, of course, be used so, but the amount of labour which is expended in the erection and re-erection forms a very serious item in the cost. Though plenty of attention has been paid to economy in the size of members, economy in the centering has not been properly studied; it is a difficult subject. A few persons in the United States have endeavoured to find a solution for the difficulty by providing various forms of collapsible and extending centering and metal forms, but the results are not very satisfactory, and in the general run of work the expedients are not possible of

adoption. It is in this direction probably that we shall see future advances, rather than in respect to any great innovations in methods and systems of reinforcing. The design of reinforced concrete is gradually becoming more standardised, and the centering itself is, to a great extent, at present standardised, but this is because of want of inventive ability and not because a thorough study has been made of the subject.

The Concrete Institute. In our issue for May 6th we announced the constitution of the Concrete Institute, the formation of which had previously been referred to in these columns. The Institute is certainly fortunate in having secured the Earl of Plymouth, First Commissioner of Works under the late Conservative Government, as its first president, while the names of Sir William H. Preece, Sir Henry Tanner and Sir William Mather as vice-presidents are all influential and respected. The constitution of the council is strong, and at a glance the names of the members will convince anyone that the Institute is an important body, and is bound to have great influence in the near future. The subject of concrete in all its applications has been attracting more and more attention for many years past, while reinforced concrete is the newest and most important advance in construction that has taken place for many years, and is attracting universal interest among architects and engineers. The Concere Institute is founded admittedly on the lines of the Iron and Steel Institute, which has done a great deal for the development of the iron and steel trades of this country during the past forty years. But cement is now used for a multitude of purposes and forms a subject of even greater importance than iron and steel, if we may judge by the quantity of work carried out by its aid, and give regard to how much that work bears on the everyday life of the general public. It is surprising from this point of view that the interests of cement manufacturers and users have not been represented by some such body before. The call for such an institution is so pressing and so widespread that it could be resisted no longer, and by the Institute coming into being so late in the day there has been left for it all the more work to do. It must be some time before the Institute can cover the wide field at all adequately. There are, for instance, such subjects as rules and regulations and the standardisation of practice in some measure, where the many vexed questions regarding materials, such as aggregates, require thrashing out, and it is doubtful whether much advance can be made in such subjects without experimental investigation. But the Institute can, while awaiting a favourable opportunity to settle such questions, provide members and the public at large with the best information available. In extending the use of concrete, plain and reinforced, its energies will be well employed at the present time. By-laws and effete public officials put many obstacles in the way of the economical employment of concrete. Although the material is used extensively, there is great ignorance displayed as to its efficient application, and the publication of papers, pamphlets, etc., which it is proposed the Institute shall undertake will not only be most valuable to the members, but indirectly advantageous to the wider circle outside. It may be expected that all those who are interested in the subject will readily join the Concrete Institute, because of the material benefits which they will personally derive in the way of meeting for the exchange of opinions, as well as the literature and advice to which they will be entitled. Architects and engineers who are even remotely attracted to the subject with the idea of keeping up-to-date, and who realise that reinforced concrete is becoming perhaps the most important subject in the theory of construction, as, indeed, it promises to become in quantity in modern architectural and engineering structures, should join the Institute, in order to aid in enabling it to make up a little, if possible, for lost time, and to serve the professional and general public in the manner for which there is so obvious and urgent a need. The offices of the Institute are at No. 1, Waterloo Place, London, S.W.

The Value of Abbreviated Formulæ. It is to be feared that to many of the younger members of the profession a knowledge of the formulæ governing the investigation of statical problems is considered to belong to the province of the engineer rather than to that of the architect. A well-directed enthusiasm for art is admittedly the chief desideratum toward success in architecture, but the science of construction also makes its demands upon the time and energies of architects, and this especially will be the case in face of the increasingly difficult structural problems of the future. The Royal Institute of British Architects, by its action some time ago, in making suggestions to the London County Council as to rules for the erection of steel-frame buildings, and its recent attitude in helping forward the work of experiment and research and the co-ordination of existing data with regard to reinforced concrete work, gives official recognition to the great importance attached by all thinking members of the profession to the study of both the theory and practice of modern construction. Those who endeavour to keep a grip upon the constructional tendencies of the day, and yet are not too conversant with the use of formulæ, will welcome the work of the compilation of tables based on established formulæ to which a few well-known authorities appear to be devoting some of their energies. Another note in the simplification of the methods of structural investigation was struck by Mr. E. Fiander Etchells in a paper read before the Society of Civil and Mechanical Engineers on May 7th, entitled "Abbreviated Formulæ for Structural Engineers." The list of formulæ touched upon by the author of the paper was fairly representative, the strength of joists and of stanchions, and the pressure on the sides of both flush-filled and surcharged coal bunkers being dealt with. The abbreviated formulæ given are not apparently intended to supersede the more elaborate and accurate methods of calculation, but rather act as preliminary or supplementary to the use of such formulæ. It occasionally happens that the designer is required to indicate, with little time for consideration, the sections of steelwork to be adopted for a particular structure. Not infrequently also a junior draughtsman, none too sure of his manipulation of the established formulæ, may desire to have a rough check to enable him to feel sure that the result obtained is not absolutely out of reason, because of some mathematical error. Also an architect may wish to check the work of an assistant without going too fully into details. In any of these circumstances abbreviated formulæ are likely to be found most useful, particularly in cases not covered by the steel section book, or in positions where that most acceptable draughtsman's companion is not immediately available, as when going over a building in course of erection. It is not possible in these columns to mention in detail the formulæ contained in the paper to which we refer. A very simple rule dealing with the strength of an ordinary rolled steel joist may, however, be quoted as interesting to practically all our readers. It is that a rolled steel joist (of ordinary joist, not stanchion, section) N inches deep over N feet span will carry a safe distributed load of *at least* N tons. This applies to practically all standard joists, except those less than 3 ins. in width. A working formula deduced from this is that the safe distributed load in tons on any section will not be less than the figure obtained by dividing the square of the depth in inches by the span in feet. Having regard to the axiom that the moment of flexure due to a concentrated load is double that produced by a distributed load of the same amount, this rule may be applied to meet most everyday circumstances.

SOME PRACTICAL POINTS IN THE EXECUTION OF REINFORCED CONCRETE WORK.

By Vere Sussex Hyde.

A great deal of theoretical discussion on the subject of reinforced concrete has appeared in the technical press, and also in book form. The writer of these notes would point out, however, that sound practice is quite as necessary as accurate calculation for the production of good work. He, therefore, wishes to set forth a few hints based on his own experience in the actual supervision of work of this description.

Drawings.

First of all it is necessary to examine carefully and minutely all drawings supplied by the designers. If these are prepared by a foreign firm, they are liable to mix the metric system with the usual English system of measurement. It is necessary, therefore, to see that the various dimensions, levels, etc., are consistent, as any variation will cause great trouble with the lengths of bars supplied, some of which may even have to be rejected.

In the case of discrepancies, a report must at once be made to the engineer, or other responsible person.

It is also advisable to see that the details of the work supplied are such as can be carried out satisfactorily.

General Organisation.

Most people advise the setting of a separate foreman over each branch of the work, but though this may be practicable on large contracts, it is not so on smaller ones, where, however, the quality of the work must be quite as good as on large buildings. Thus on a small building it becomes especially necessary for the clerk of works to see that the workmen go about their duties properly. On such small contracts it is usual to find one good general foreman with practical knowledge of the various building trades, one foreman carpenter, three or four scaffolders, and perhaps a smith, with assistance in the shape of several rough carpenters, and more or less unskilled labourers. Under these conditions it is obviously impossible to have a foreman to supervise each branch of the work.

Centering and Shuttering.

The first necessity is to have the centering perfectly rigid under the weight of the wet concrete, workmen, etc. Failure in this respect arises from the use of too light planking, shores, etc. If the centering sags, the result will be a permanent sag in the underside of the slabs or beams, which will utterly spoil the look of the finished work.

The second point is that the moulds should be so constructed and put together as to be readily removable. They should fit together and support one another as much as possible without the use of nails. The rough carpenters employed on small works generally have one great ambition, which is—to drive nails, and drive them home at every opportunity. This should be guarded against, and the nails that are used should be left projecting $\frac{1}{4}$in. or so, to allow of their being easily drawn when the centering or falsework is being struck.

In connection with all vertical members such as columns or pilasters, etc., it is necessary to see that all the forms are truly plumb, and the sides square to one another.

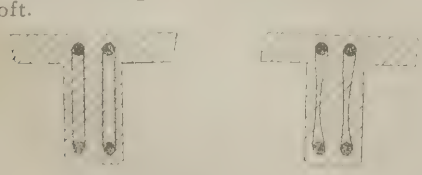
The various forms, timber, etc., should be used as many times over as possible, and this especially is where a good carpenter will show his skill and ingenuity. It is advisable that the inside faces of all falsework should be washed over with soft soap and water, or lime-wash, to prevent the concrete adhering to it.

Arrangement of Bars.

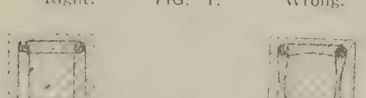
The correct arrangement of the framework of bars is the part of the work which will probably receive least attention at the hands of the uninitiated foreman. That which appears trivial to him is really of the greatest importance. The disarrangement of stirrups, ties, and small bars after being put into position must be particularly guarded against, also the knocking with heavy hammers to get the bars into place. Walking over floors where bars have been laid out in position must not be allowed except for the purpose of completing the work, and then planking should be laid down for the wheelbarrows.

The laying-out of bars in slabs may be done thus: The spacings should be marked with red or blue chalk on the centering, at least two marks being made for the length of each bar, so that every bar is laid truly square. When this has been done, bars which cross should be tied together firmly with wire at each alternate crossing at least. A good method of keeping the bars at the right level is to place a round bar of the necessary diameter underneath, and to roll it forward as the concreting proceeds.

In some systems the bottom of the beams must have an inch layer of concrete laid before the bars are put in place, but in one system the stirrups serve to lift the bar through the concrete while it is soft.



Right. FIG. 1. Wrong.



Right. FIG. 2. Wrong.

Stirrups or ties in beams, posts, etc., must be straight and tight, and not curly, as shown in Figs. 1 and 2.

A certain amount of care should be taken of the bars while they are lying about the job. No scale or paint is permissible on a bar, but a slight skin of rust is found to be an advantage. Of course, this should not be allowed to go very far, and if bars are to remain in the open any length of time they should be covered with tarpaulins, or coated with a wash of cement grout before damage is done.

All consignments of bars arriving on the works must be checked, to see that they correspond with the specification or list of bars supplied for the work.

Concreting.

Before commencing the deposition of concrete, all the moulds intended to be filled must be examined, to see that they do not contain bits of wood, sawdust, nails, and other rubbish. All pieces of wood used to space out bars must be removed in good time. In columns and vertical panels a portion of the shuttering at the bottom should be left unfixed till the last moment, so that any odd bits of wood, etc., may be removed.

The concrete must not be mixed too wet, for, if it is, the cement will be carried away through all the small cracks in the centering, leaving honeycombs in the concrete. Besides this, the more water is used the greater is the shrinkage of the cement. Workmen are more likely to make the mixture overwet than overdry, on account of the greater ease in handling and less ramming that will be required. At the same time it is, of course, necessary for concrete to be sufficiently moist to work satisfactorily into the moulds and around the reinforcement. A little experience is required to enable a man to judge the exact degree of wetness.

Arrangements must be made, if possible, to carry out the concreting over a complete area at one time, so as to ensure the work being monolithic.

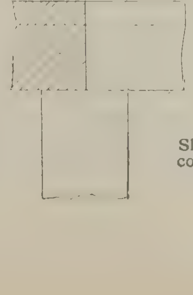
Where the whole of the floor is not completed in one day, the work should be stopped or divided as follows:—*A beam* must be carried to the centre of a column; *a secondary beam or joist* must be filled up to and at the same time as the beam on which it rests; *a slab* must be carried to the centre of a beam or joist; *a column* must be carried up to its full height; *walls* surrounding a tank or similar structure should, if practicable, be worked up along the whole length simultaneously, but, if stopped, it should be at horizontal level.

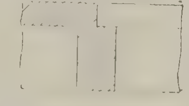
Beams and slabs must, as far as possible, be filled together to ensure a monolithic result.

The concrete spread on a floor should be carried forward on an even line across the whole width of the bay.

In vertical panels one side should be kept open and boarded up in 2ft. or 3ft. sections as the work proceeds.

If pouring is the method of filling employed, columns or posts should not be filled to a greater height than six times their scantling at one pouring; necessary openings must be left in one side of the mould. In filling columns it is essential that the concrete is sufficiently fluid to get round the bars and ties, and it should be very well rammed with a longish bar. It is in filling columns that the greatest difficulty is caused by large stones in the aggregate. A 1in. screen is often found to be useless, and the writer has had occasion to order the use of a $\frac{1}{2}$in. screen for this purpose where the space allowed around the bars was rather narrow.





FIGS. 3 AND 4.

Showing where to stop concreting to a beam and a slab.

Speaking as a practical man, he would like to express the opinion that a 1in. screen is quite inadequate for the purpose; a $\frac{3}{4}$in. mesh only giving sufficient fineness for common purposes; a $\frac{1}{2}$in. screen is required for really good work.

One important point about the size of a

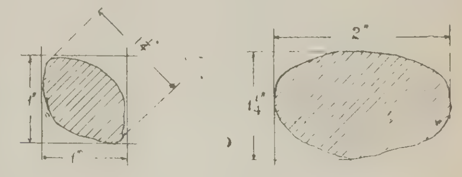


FIG. 5.

square screen is that a stone, as shown in Fig. 5, will pass a mesh much smaller than its own greatest dimension.

While speaking on this subject, the writer would suggest that designers allow a little more space than is generally now provided for the passage of concrete round the bars.

The proportions of cement and aggregate must be specified by the engineer, and a keen eye kept on the mixing by the clerk of works, to see that the specification is carried out.

In regard to the setting of concrete, in hot weather it will dry out too fast to set properly, as setting only goes on while moisture is present with the cement. It is advisable, therefore, to water the concrete two or three times on its exposed surfaces during the first fortnight after laying.

Concreting should on no account be permitted to take place during frosty weather, as the result will be disastrous.

Striking of Centering.

The ease with which centering is removed is the great test of its good construction. But however well it may be constructed, it is necessary to employ a sufficient number of men to strike it. At least four or five careful men should be employed. It should be made very clear to them that the concrete is not thoroughly set at this time, and that they must exercise all care to prevent jarring it or chipping off arrises, etc. Two or three men with one crowbar must not be allowed under any circumstances to roughly wrench off the shuttering.

The time for the removal of all falsework must be according to the engineer's instructions, as opinions vary on the subject, but, speaking generally, the following times are found satisfactory:—

For slabs and beams the centering should be loosened in seven or eight days, and struck in ten days.

For wall panels the shuttering can be removed after two or three days in moderate weather.

For columns, etc., three or four days under similar circumstances.

It is advisable, however, to loosen centering before striking, in order to prevent the concrete sticking to the boards; moreover, the air circulating through will cause a slight hardening of the surfaces, and thus they will not be so liable to be chipped.

In all cases of beams and slabs, underneath after the centering is struck temporary shores must be placed at judiciously-chosen points, and left for another seven days at least.

The most important points to be chosen will be the centres of beams and floor slabs.

No weight except the dead weight of the lumber should be allowed on a floor or against a wall for three weeks; that is, until the removal of the centering. After this, small weights may be allowed, but nothing approaching the calculated load on the works for six clear weeks from the laying of the concrete.

In order to ensure accuracy in these particulars, it is desirable for the clerk of works to keep a diary recording exactly each day's work from the commencement of the contract.

EARLY EXAMPLES OF REINFORCED CONCRETE.

We publish on this page two photographs of buildings constructed in reinforced concrete by P. Brannon, who was one of the earliest workers in reinforced concrete in this country. He took out his provisional patent in 1870, fully protected it in 1871, and took out further patents in 1874. Brannon managed to get a small syndicate formed to work these patents, which was called "The Monolithic Fireproof and Sanitary Construction Works, Ltd." This firm carried out a certain amount of building work in concrete reinforced with a network of iron rods. The examples at Walton-on-the-Naze, here illustrated, probably date from about 1875. The private hospital is quite a large work. The shop and dwelling-house in the main street of Walton-on-the-Naze formed Brannon's private house for some years. The photographs show that these buildings are in an excellent state of preservation.

SHOP AND DWELLING-HOUSE AT WALTON-ON-THE-NAZE.

Brannon was apparently the first to suggest the construction of piles of reinforced concrete, which he proposed to form of square section with angle-iron embedded in the concrete at the corners, connected by riveted or bolted lattice bars and wound round with a hooping of small section rod. His 1870 patent also suggests the protection of sea-shores by the construction of groynes and sea walls of reinforced concrete, an idea which has only been applied in practice comparatively recently. He antedated Thaddeus Hyatt, who had a number of experiments conducted on reinforced concrete beams by Kirkaldy in 1877, details of which were published in a work in the same year, printed for private circulation, from which it appears that Hyatt had practically determined many of the principles applied by later inventors. W. B. Wilkinson, however, had patented a reinforced concrete beam in 1854, and proposed the construction of reinforced concrete floor slabs and arches, while there were several other inventors who reinforced floor slabs before Brannon, whose patent does not specifically relate to the construction of beams. He seemed to depend more upon the intimate admixture of iron in small section throughout the mass of the concrete, such as by constructing a close meshwork of hooping, and does not appear to have understood the theory of the subject. His method of reinforcing is somewhat allied to the early efforts of Monier and Cottancin, in France.

The two English examples here reproduced for the first time may possibly be

PRIVATE HOSPITAL, WALTON-ON-THE-NAZE.
Built by Brannon about 1875.

the earliest that have been illustrated, the only example that approaches them being the house in New York City, U.S.A., which was constructed by W. E. Ward, in 1875, in which metal is embedded in concrete to strengthen the walls, floors, beams, and roof. The details of the reinforcement are not available in any of the cases, so we do not know whether any real science was displayed by Ward or by Brannon.

REINFORCED CONCRETE SYSTEMS.

No. XX.—The Williams System.

The system which is the subject of this article was introduced in 1902, and is the outcome of the experience of the patentee, Mr. Arthur E. Williams, A.M.I.C.E., M.I.E.E., of Dagenham Dock, Essex, in the construction of a large reinforced jetty, engine and boiler-house in 1901, on the Hennebique system, for Messrs. S. Williams and Sons, Ltd.

Mr. A. E. Williams, it may be mentioned, was born in 1867, and received his engineering education at the Crystal Palace School of Engineering. He is the youngest son of the late Mr. Samuel Williams, who was for many years a member of the Thames Conservancy, and a well-known authority on matters relating to the River Thames.

Mr. Williams does not claim for his system that it is more scientifically correct than other well-known systems on the market, nor that steel is economised, for he has designed it more with a view to its practical utility and general economy.

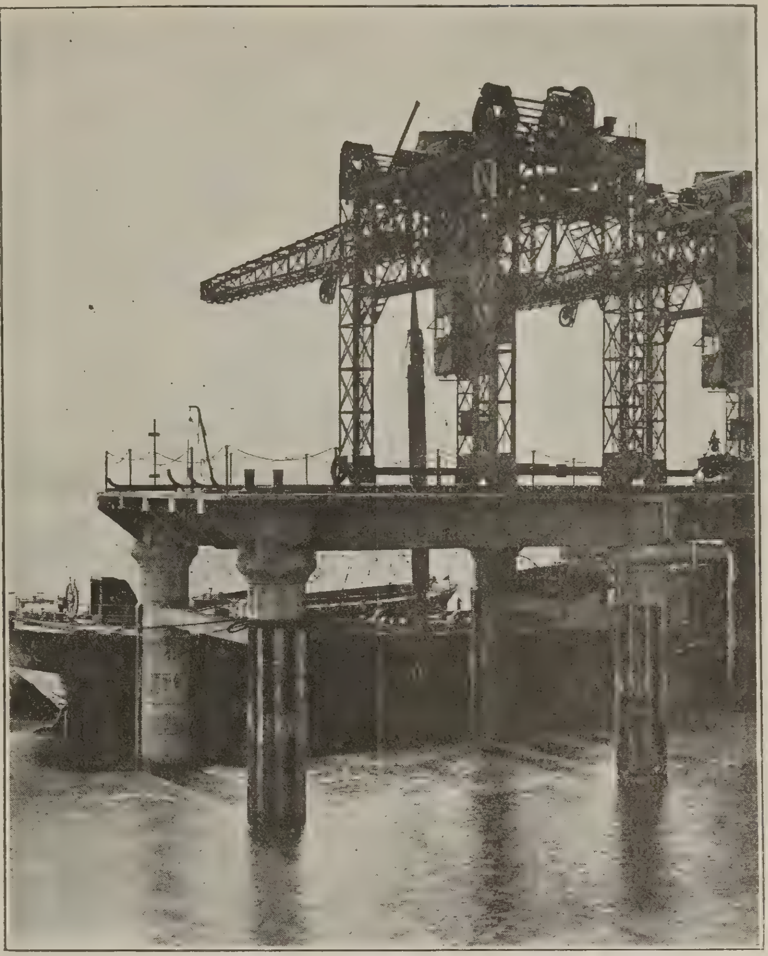


FIG. 5. ADDITION TO COALING PIER, DAGENHAM DOCK.

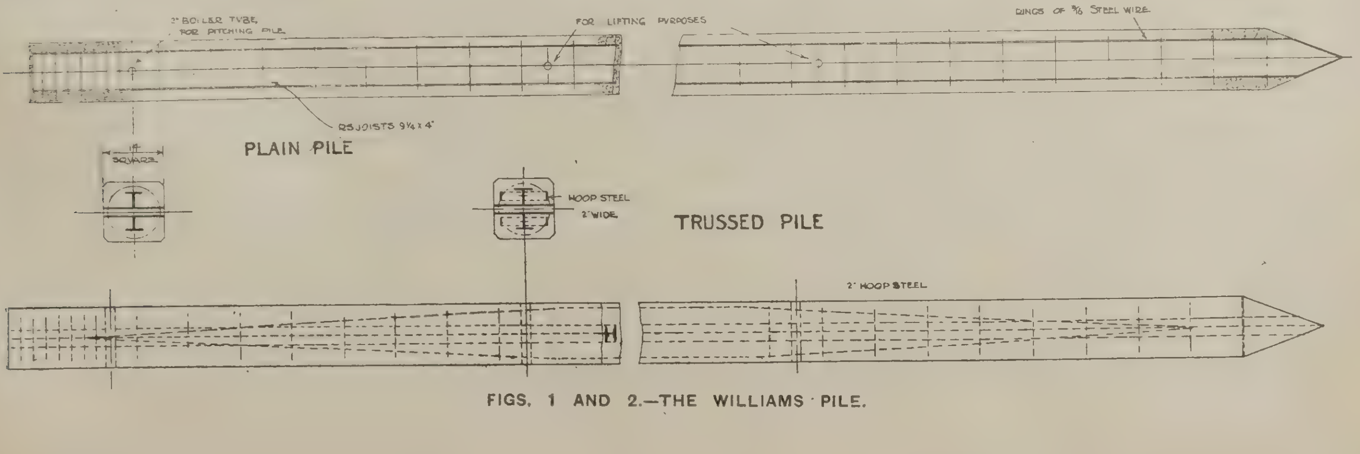
The Williams Piles.

The Williams system is chiefly applicable to the construction of piers, jetties, wharves, etc., where piles or pile foundations are used. The chief feature of the system is the form of reinforced concrete pile invented by Mr. Williams. The piles are constructed with an I section joist running from end to end, encircled by $\frac{3}{16}$ in. round steel hoops at suitable intervals. A pile shoe of the ordinary form may be used, but as a rule the end of the joist is pointed by cutting away the web for a short distance and forging the flanges to a point.

Figs. 1 and 2 show the construction of two types of the Williams pile, the former being a plain pile, and the latter a trussed pile that will be referred to later. The piles are 14ins. square, and the rolled steel joist is 9¼ins. by 4ins. by 20½lbs. per foot run. The square end of the joist is covered by about 2ins. of concrete, and the web of the steel is drilled with six ⅝in. diameter holes to template. The rings of steel are about 11ins. in diameter, and are placed at intervals of about 12ins., and embedded in the concrete. At three places holes for lifting purposes are made by inserting pieces of 2in. boiler tube through holes drilled down the centre line of the web of the joist. The first of these pieces of tube is 2ft. from the top of the pile, and is used as a gauge bolt hole, and also for pitching the pile with the aid of a long shackle and pin; the other two pieces of pipe are situated at points respectively one-quarter the total length of the pile on each side of its centre, and are used for slinging in a horizontal position. This arrangement, together with the stiffness obtained from the joists, enables the piles to be lifted off the stage on which they are moulded within a week, thus affording considerable economy in the cost of moulds. The piles are fit to drive in one to two months, according to the time of year.

We have referred above to the fact that the upper end of the pile joist is drilled with six holes to template. When a pile is driven, the concrete can be broken away from the top and another piece of joist easily fished on by making use of these holes, and the pile built up to the top of the work, thus making a satisfactory continuous pile from top to bottom. The concrete used for these piles is proportioned: 200 lbs. Portland cement, 3 cub. ft. ¼ in. sand, and 6 cub. ft. ¾ in. shingle, machine mixed, and well rammed by hand in the mould.

Mr. Williams recommends that with piles for a jetty, or other similar purpose, they should only be ordered long enough to ensure their heads being a few feet above low-water mark when driven home. The concrete is broken away for about 18ins., the joists cut to the proper length to reach to the top of the work are fished on, moulds placed round, and concrete filled in. This method enables the engineer to use the shortest possible piles, which are easy to handle, while at the same time preventing waste through having to cut off the heads. The use of a stiff section of steel, such as a joist, has the advantage that in case the concrete should fail locally, either through bad moulding or



FIGS. 1 AND 2.—THE WILLIAMS PILE.

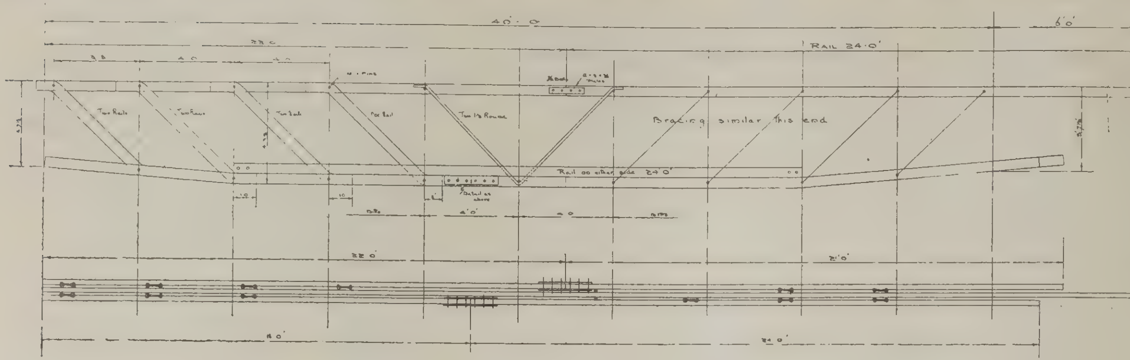
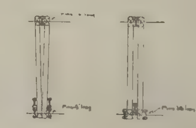



FIG. 4. COALING PIER, DAGENHAM DOCK: DETAIL OF LONGITUDINAL GIRDERS,

workmanship, it is sufficiently strong to allow the pile to be driven home notwithstanding such failure.

In the driving of the Williams piles where such are likely to be subjected to bending from pressure applied laterally, the ordinary rolled joist does not give sufficient stiffness in a direction normal to the web; therefore, Mr. Williams has designed the type which he calls a "trussed" pile. This has four flat bars of hoop steel 2ins. wide, two on either side of the web, attached to the web at the ends, and bent out in the form of a truss (or curve if desired). Otherwise, the piles are practically similar in detail to the plain type.

The driving of the Williams piles is performed by the ordinary pile-drivers, but the head of the pile is protected by a hard wood dolly about 3ft. long, which receives the blow of the ram. It is better to use a heavy ram with a few feet fall for driving, rather than a light ram with a long drop. A 2-ton ram falling 6ft. is generally used, but 8ft. blows have repeatedly been given without damaging the piles.

Superstructure.

Mr. Williams is responsible for various ideas for the construction of reinforced concrete superstructures to his piles. Fig. 3 shows the arrangement of reinforcement of walings, struts, girders, and deck for a jetty now being constructed at Dagenham Dock from his designs to carry cranes to lift 5-ton loads. It will be seen that he advocates the use of small joist sections with round rod vertical members for the reinforcement of the girders. It will be noticed, also, how easily these small I section reinforcements can be bolted to the pile joists in order to keep them rigidly in their place whilst the shuttering is being fixed and the concrete rammed. The vertical reinforcements resist

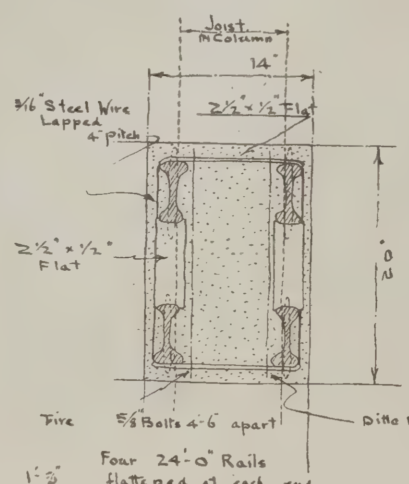


FIG. 6. CROSS-SECTION OF STRUTS.

diagonal tension, or, as it has been often loosely called, shearing stresses. They consist of a series of round bars just split or fish-tailed at the ends and dropped in between the joists without any attachment thereto, as Mr. Williams is of opinion that this is sufficient. Fig. 4 shows a detail of the reinforcement of the longitudinal girders of an addition to the coaling pier at Dagenham Dock. As will be seen, old railway metals were used for the longitudinal members. The amount of steel in parts is rather extravagant, but as the old rails were very cheap that did not matter. The whole structure was bolted up with 1 in. bolts and could be handled by a crane and dropped into the shuttering. It will be noticed that in the main outside girders a single rail is used in the top boom and two in the bottom boom. These latter are further reinforced by two extra rails laid upon the top of them in the six centre bays, The bottom rails are set up at each end to clear the reinforcement of the cross-girders. The right-hand end forms the cantilever at end of pier shown in the photograph, Fig. 5. The outer diagonal tension reinforcements (or shear members) consist of pairs of short rails bent at the top and bottom to the horizontal. The four centre diagonals are single rails in two cases and two 1½ in. diameter round rods in the other two. The inner girders are much the same, with only three rails in the bottom boom. The arrangement adopted has given very satisfactory results, no sign of cracks being visible under the heavy fluctuating load of the coaling crane. The accompanying illustration also shows a detail of the diagonal struts which transfer some of the load from the centre of the side piles, and shows the easy connections afforded to the column joist reinforcements.

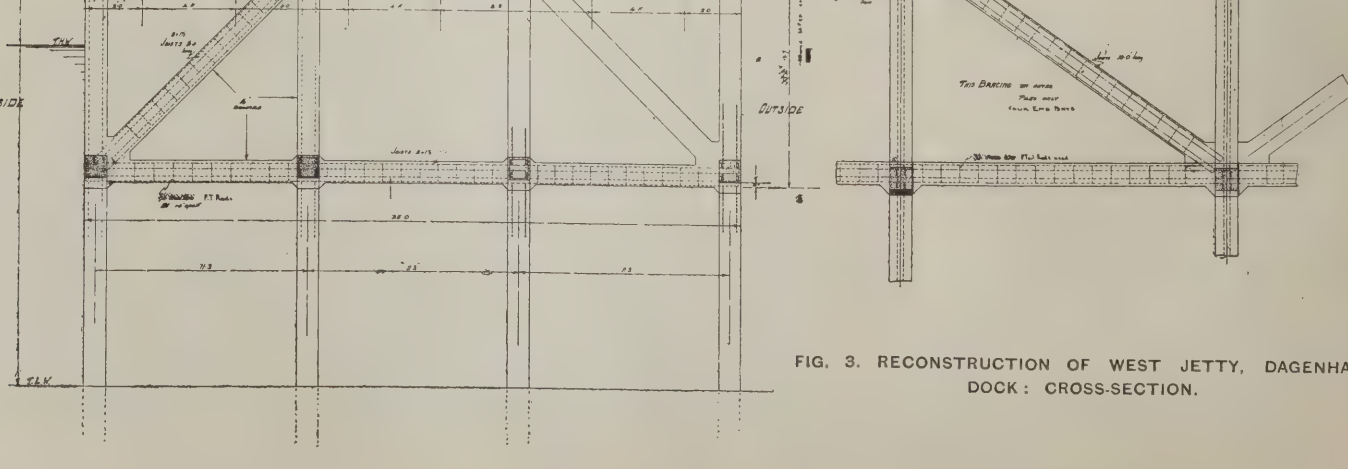


FIG. 3. RECONSTRUCTION OF WEST JETTY, DAGENHAM DOCK: CROSS-SECTION.

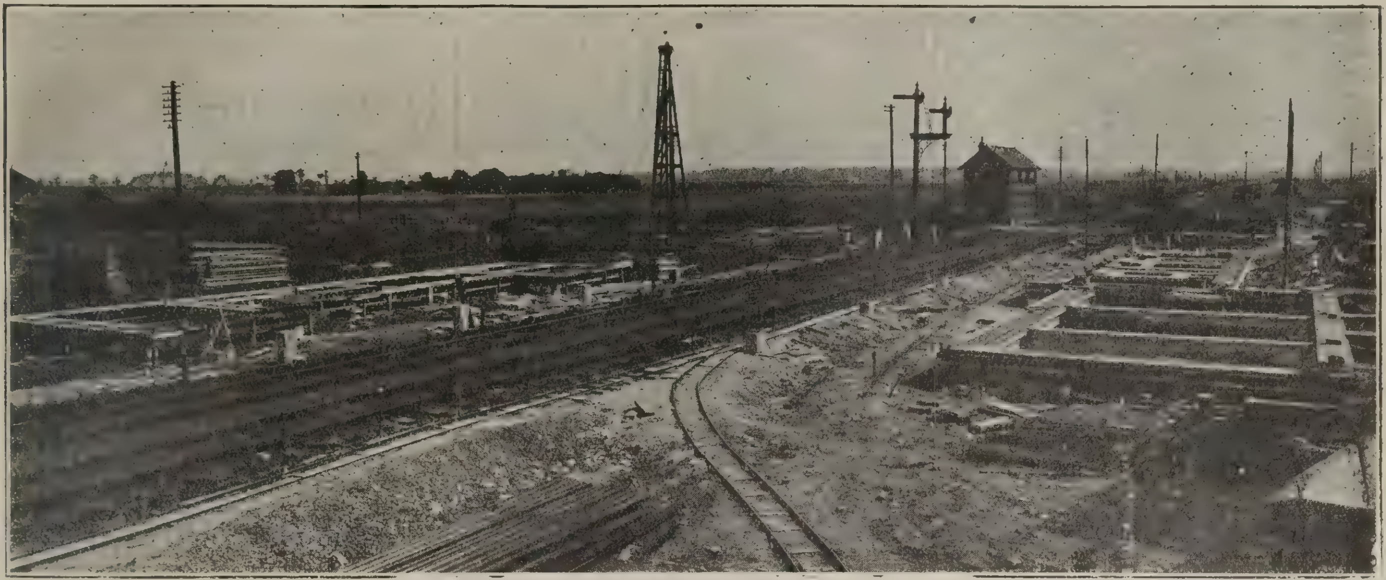


FIG. 12. FOUNDATIONS OF DAGENHAM DOCK STATION

Beam Reinforcements.

Mr. Williams has also adopted other forms of reinforcement for beams and girders, which we illustrate in Figs. 7, 8, and 9. Figs. 7 and 8 are types of beams which were constructed for experimental purposes and tested by Messrs. David Kirkaldy and Son in 1902-3. Fig. 10 shows the section of the beams of the type illustrated in Fig. 7, which were tested by Messrs. Kirkaldy. The reinforcements consisted of 3ins. by 3ins. joists lapped with wire 0.2in. diameter wound spirally with about 3ins. pitch. The dimensions of the beams were 7ins. wide by 24ins. deep, resting on bearings 10ft. apart. The load was applied at the centre. Two beams when tested at two months old began to yield at about 60,000 lbs. load, and failed ultimately at 81,000 lbs. Another beam, not so old by one week, gave an ultimate resistance of 70,000 lbs. Fig. 11 shows the details of the reinforcement of the type illustrated in Fig. 8, tested by Messrs. Kirkaldy. The main reinforcements consisted of four rolled joists 3ins. by $1\frac{5}{8}$in. with two bracing joists as sketched, connected by bolts. The beams measured $7\frac{1}{4}$ins. wide by $24\frac{3}{4}$ins. deep, and the span was 10ft. One of the beams which had only these main reinforcements with bracing joists when tested after two months gave an ultimate resistance of 83,000 lbs., while the second substantially similar beam, which, however, had the main reinforcements all lapped with wire 0.2in. diameter wound spirally at about 3ins. pitch, gave an ultimate resistance of 91,500 lbs. The concrete used in these test beams was composed of 2 parts $\frac{3}{8}$in. shingle, 1 part $\frac{1}{4}$in. sand and 3 bags of cement to the yard.

The above results show that the best was the beam reinforced with longitudinal and inclined joists with a wire hooping, and next in order a similar type of beam without the hooping, while the last in order was the type of beam without inclined members, but with hooping alone, though the results were all fairly satisfactory, and showed that beams reinforced on this system were thoroughly reliable.

Mr. Williams suggests that old railway metals can often be used in this form of construction with considerable economy.

For the decking of floors Mr. Williams advocates the use of small joists with hoop steel alternately above and below, forming a series of trusses.

Connection of Superstructure to a Pile Foundation.

One detail in connection with the construction of jetties and similar structures to which Mr. Williams has paid particular attention is the means of attaching the superstructure to the pile foundation. It has been customary when forming a column for carrying a pier or other structure whose foundation must be below low-water mark to drive a cluster of piles to just above low-water level, and to construct thereon a temporary platform of wood, and from this to build up a column of the desired diameter incorporating and being supported by the tops of the piles. Not only is this method unsightly, as the piles are seen beneath the columns at low water, but it has the objection that, should a considerable depth of water exist alongside, the piles themselves may be unstable from lack of bracing, and the join between the piles and the column then becomes a source of weakness. Mr. Williams proposes to overcome this difficulty by driving only the centre pile of a group in the first place; he then drops over this centre pile a horizontal section of the column of suitable depth having keying recesses with any desired number of holes for the piles cast in it; section after section is added until raised to few feet above low-water mark, and the whole is left for a short time to settle. Afterwards the piles are driven through the holes cored for their reception, and the whole is grouted up solid. The projecting heads of the piles are then broken and fresh joists riveted on,

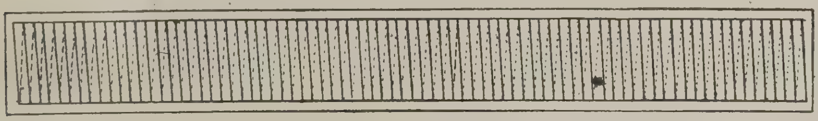


FIG. 7. BEAM AS TESTED BY KIRKALDY AND SON.

FIG. 10.

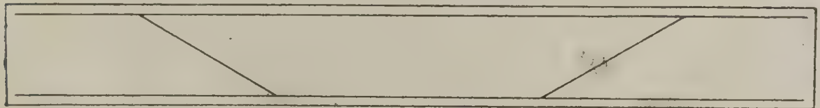


FIG. 8. QUEEN TRUSS BEAM.

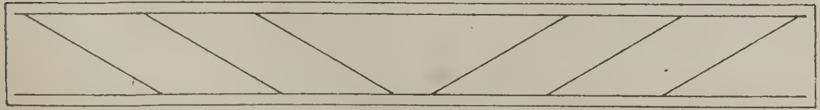


FIG. 9. MULTIPLE TRUSS BEAM.

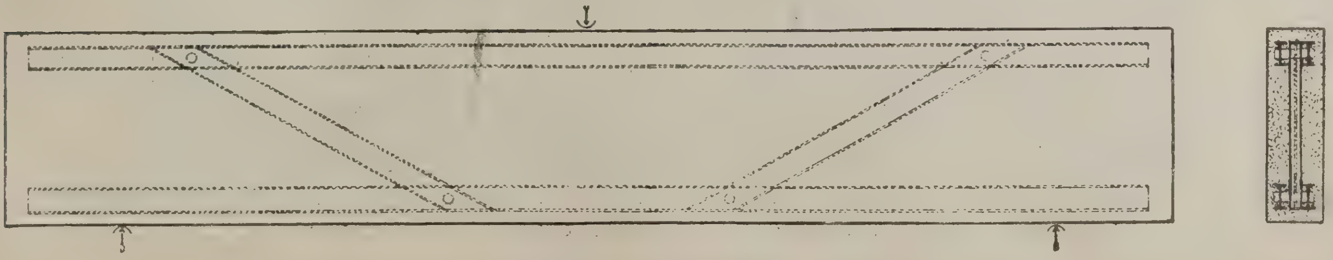


FIG. 11. SECTION OF WILLIAMS BEAM REINFORCEMENT AS TESTED BY KIRKALDY AND SON.

and the rest of the column moulded around them in the usual way. By this means the upper part of the column and superstructure are properly carried on the piles.

Retaining Walls or Camp Sheathing.

The same system is proposed for adoption with the retaining walls or camp-sheathing, the piles being driven at suitable intervals, sections of the wall dropped over them, breaking the joint with every layer, until low-water mark is reached, and finally the remaining piles being driven through the holes cored as in the columns. In this way the piles support the weight of the wall, while its own weight is designed to prevent it being overturned.

Dagenham Dock Station.

Fig. 12 shows the foundations of the railway station which has just been completed at Dagenham Dock on the Williams system; the heads of the piles along the sides of the tracks are clearly shown; these will sustain the awning columns; the vertical rods seen standing up by the side of the track in the foreground are the vertical reinforcements for the walls of the platforms. The foundations of the station buildings are also upon piles with connecting beams and reinforced concrete designed by Mr. Williams.

As regards the theory of calculations, Mr. Williams favours the ordinary system adopted by the majority of engineers and advocated by the R.I.B.A. Joint Committee on Reinforced Concrete, the German Government, and others, with suitable factors.

Contracting.

The system has not been pushed, as it was intended more for private use in the development of the Dagenham Dock estate, but the piles, etc., can be manufactured under royalty, or when the cost of transport is not prohibitive, can be supplied to contractors from stock, ready for driving.

The following is a short list of works that have been executed on the Williams system:—

Foundations for the New Tilbury Station.
Ditto Water Tank, Tilbury Station.
Ditto Turntable, Tilbury Station.
Ditto Dagenham Dock Station.
Ditto Signal Boxes, Little Ilford.
Ditto Footbridge, Rainham.
Ditto Roman Catholic Church, Tilbury.
Jetty at Tilbury. Jetty at Dagenham.
Lengthening Pier at Dagenham.
Piles supplied to Hull Corporation.
Ditto Gas Light and Coke Company.
Ditto Kirkcaldy Harbour, etc.

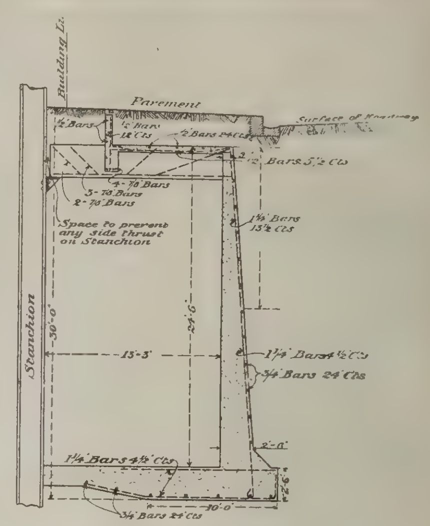
These piles are the only reinforced concrete specified for the New Dock at Southampton.

A REINFORCED CONCRETE RETAINING WALL.

On this page we publish illustrations of a reinforced concrete retaining wall constructed for the Royal Insurance Offices in Piccadilly, London, W. The wall is quite unique in design.

The depth from the surface of the ground to the bottom of the wall is 30ft., and the wall tapers from 30 ins. at the bottom to 9 ins. at the top. It is interesting to compare this with the thickness of an ordinary solid masonry retaining wall, which would be 8 ft. to 10 ft.

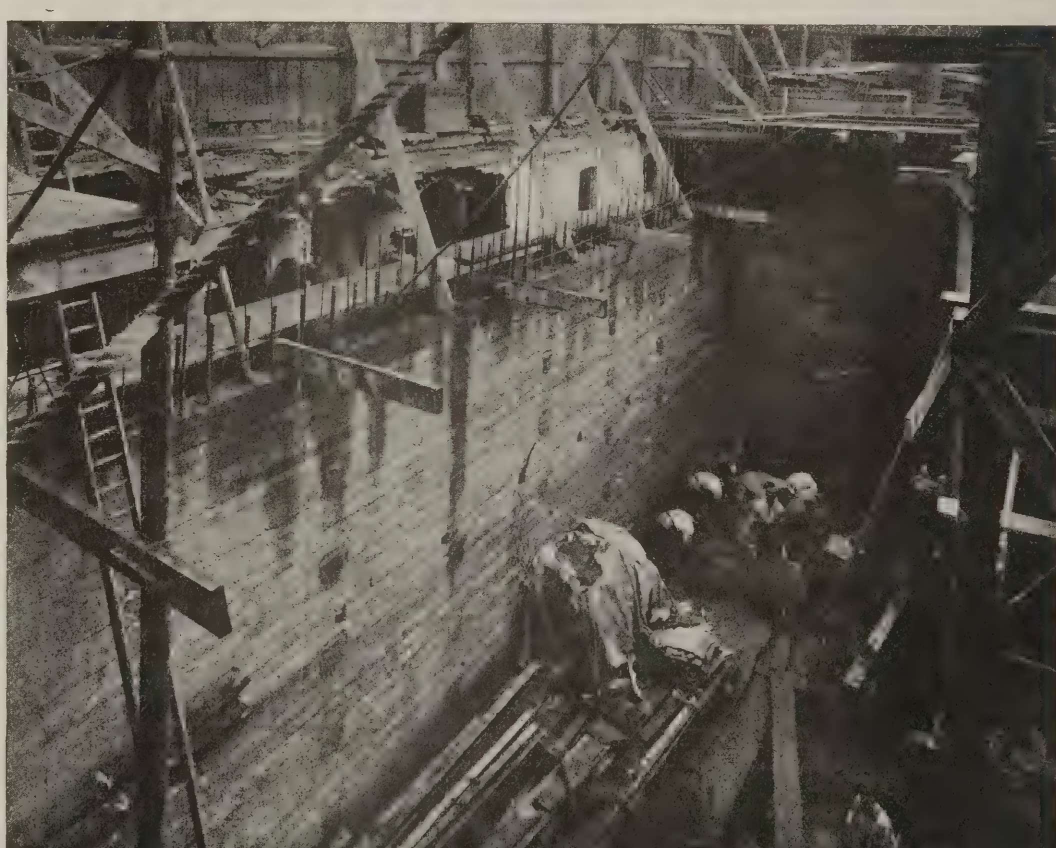
The horizontal beams merely carry the pavement and afford no horizontal support to the wall, the earth thrust being entirely taken by the wall. The base of the wall, of course, acts as a cantilever, and at its junction with the wall has to resist the same bending moment as the vertical portions of the wall itself. The amount of reinforcement of the base is therefore the same as that in the wall, namely, $1\frac{1}{4}$ in. "Indented" steel bars spaced $4\frac{1}{2}$ ins. apart, with a light network of bars crossing these trans-



SECTION OF RETAINING WALL.

versely of $\frac{3}{4}$ in. bars at 24 in. centres. If any vertical settlement of the wall were to take place owing to the ground below it giving way, some tension might be introduced in the top of the slab; a second system of bars was therefore placed on the top of the slab to resist this. In the wall, every third bar only is carried to its full height, the others being stopped at a height of 14 ft.

The concrete used was proportioned 5 parts of Thames ballast graded in size from $\frac{1}{4}$ in. to $\frac{3}{4}$ in., 2 parts sand, and 1 part "Ferrocrete" cement. The reinforcement throughout is of "Indented" steel bars, supplied by the Indented Steel Bar Co., Ltd., of Queen Anne's Chambers, Westmnster. The consulting engineer for the work was Mr. Alexander Drew, C.E.



RETAINING WALL AROUND BASEMENT OF ROYAL INSURANCE OFFICES, PICCADILLY, LONDON.
VIEW SHOWING WORK NEARING COMPLETION: SHUTTERING REMOVED FROM LOWER PORTION.

REINFORCED CONCRETE IN MUNICIPAL ENGINEERING.*

By W. Noble Twelvetrees, M.I.Mech.E.

Such progress has been made during recent years in the application of reinforced concrete to engineering structures of almost every class, that it is scarcely necessary to define the nature of the material in question. It may be convenient, however, on the present occasion to state very briefly some essential points connected with the theory and practice of reinforced concrete construction. The case of a beam best illustrates the fundamental principle and practical advantages of applying concrete in combination with steel. In a rectangular beam composed of plain concrete whose resistance to tension is, say, one-tenth its resistance to compression, we have an example of particularly uneconomical design, for while the concrete in tension is working at its full capacity the concrete in compression can only be utilised to the extent of one-tenth its actual resistance.

By adding a suitable proportion of steel in the tension area of such a beam the full resistance of the concrete in compression can be developed, and so it might at first sight appear that the resistance of the beam would be increased tenfold. But in reality the advantage is not so great, because in a reinforced concrete beam the position of the neutral axis is governed by the relation between the stresses developed in the concrete and the steel, and by the respective coefficients of elasticity of the two materials. For concrete and steel of average qualities the neutral axis will be found by calculation, when an economic proportion of reinforcement is employed, to occupy a position somewhere about one-third of the distance from the top of the beam to the centre of the reinforcement. Hence, in a general way, it may be said that the area of concrete in compression is reduced from one-half the total area, as in a plain concrete beam, to one-third the total area in a reinforced concrete beam. The result is that instead of increasing the resistance of the plain concrete beam ten times by the addition of reinforcement, we can only increase it by about seven times. That, however, is a very important advantage, representing a saving of something like 600 per cent. in actual construction, and bringing the cost of a reinforced concrete beam below that of a rolled steel beam of equal resistance, quite apart from the further advantage that the reinforced concrete is in itself an excellent fire-resisting material not liable to corrosion, and so need not be encased in the manner necessary for the protection of steel members against fire and corrosion.

Theoretical Advantages.

The theoretical advantages of reinforced concrete columns and struts are not quite so pronounced as those of reinforced concrete beams. Thus, considering a column under purely axial load, the effect of incorporating longitudinal steel bars in the concrete is simply to add the compressive resistance of the steel to the compressive resistance of the concrete. That does not suggest any theoretical advantage. But by including also transverse reinforcement proportioned and disposed so as to bind the longitudinal bars of steel altogether, and at the same time to bind the interior core of concrete so as to reduce the lateral expansion of that material when under axial load, the resistance of the concrete to compression may be considerably increased. As, in accordance with Poisson's ratio, the lateral expansion of every material is small as compared with its longitudinal compression, it follows that a given amount of steel employed as lateral reinforcement produces a greater effect than the same amount of steel applied as longitudinal reinforcement, the ratio of 2 : 4 : 1 representing the efficiency of transverse as compared with longitudinal reinforcement, so far as concerns resistance to axial compression alone.

But in actual construction, columns and struts are always subject to flexure, owing to intentional or accidental eccentricity of the loading, and so the longitudinal reinforcement is an essential and most important feature of reinforced concrete columns and struts. Steel thus applied to resisting flexure is quite as economical as the steel in a beam, and on the whole it must be admitted that the theoretical case for reinforced concrete columns and struts is a strong one.

ractical Advantages.

From the practical standpoint, we have the recommendations that members of the class now under consideration are not more bulky than cast-iron and steel columns encased in fire-resisting material of the requisite thickness, and that by the employment of reinforced concrete throughout any given structure the solidity and rigidity afforded by monolithic construction can be secured without additional cost.

Members of the two types here briefly taken into consideration enter largely into every class of engineering construction. Some special forms of design necessarily involve different treatment, but, speaking in general terms, it may be said that the principles governing the application of reinforced concrete in municipal engineering are not essentially different from those summarised above.

Aggregate.

In practical work it is essential that the concrete should be of suitable composition for the intended purpose, carefully mixed and carefully applied. In some classes of work refuse destructor clinker of hard quality may be employed as aggregate—a fact which should be an additional argument in favour of reinforced concrete among municipal engineers having fewer opportunities for the disposal of clinker than could be desired. For structures where strength is a primary consideration, nothing but stone of hard and durable quality should be employed. Whatever be the nature of the aggregate, care must be taken to avoid any substance liable to disintegration, or containing sulphur, and the aggregate must be crushed to suitable size so that the concrete may be able to find its way between all interstices of the reinforcement.

The proportions of the concrete necessarily vary in accordance with the nature of the work to be executed. For structures exposed to sea water, or intended for the storage of water, the proportions should be such as to make an impervious mixture, which is always preferable to porous concrete with surface rendering or other treatment intended to prevent the penetration of moisture.

Having a suitable mixture for any given purpose, care must be taken to prevent workmen from using any of it after the process of setting has once commenced. Precautions must be taken to secure a thoroughly satisfactory bond between all parts of the concrete work; no loads should be placed on any structural members until the concrete has properly hardened, and none of the moulds, centering, and supports should be removed until some duly competent person has satisfied himself that the work is capable of supporting its own weight with perfect safety.

Reinforcement.

Whatever be the form in which the steel be applied for the purpose of reinforcement, the metal must always be applied in the proportions and positions indicated by the calculated distribution of internal stresses, and there should be an ample thickness of concrete outside the metal as a protection against corrosion and fire. These are essentials which cannot be secured without close supervision, for however stringent may be the terms of a specification, workmen are apt to make mistakes and to permit the reinforcement to be displaced during the deposition and ramming of the concrete unless carefully watched, this point being of special importance in cases where contractors are employed who have had little experience of reinforced concrete construction.

Provided that these and kindred conditions be duly complied with in the execution of correctly prepared and prudent designs, the result will be the attainment of strength, rigidity, elasticity, and durability far in excess of the same properties as individually possessed by steel, stone, or any other materials when applied separately or together in accordance with customary practice.

The Obsolete By-laws.

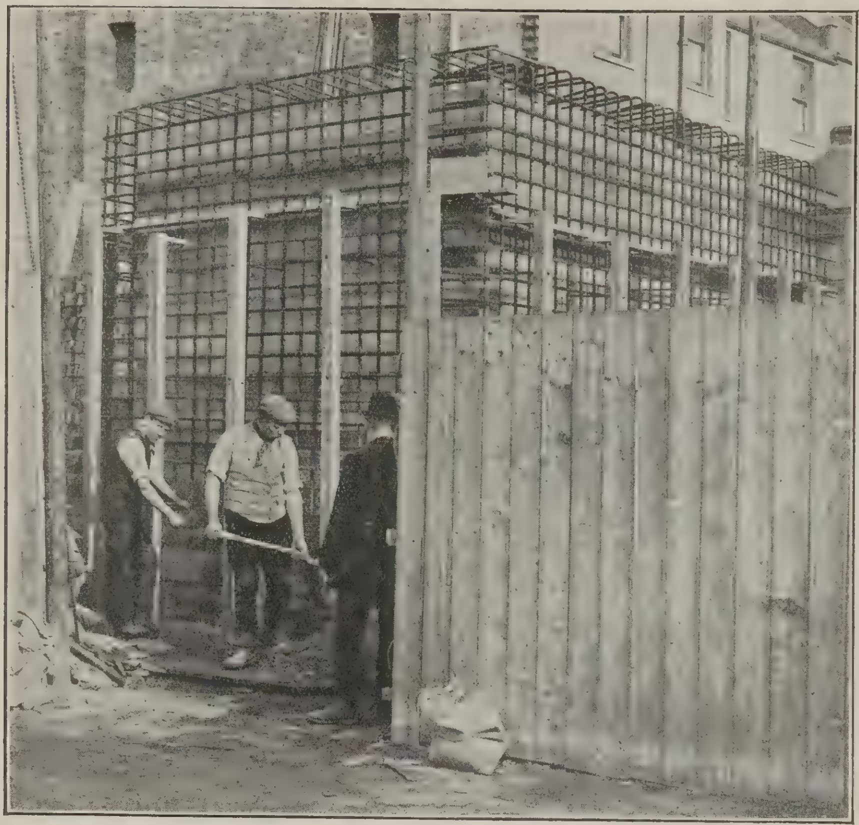
Numerous tests of structures and practical experience in this country and all parts of the world fully support the claims made on behalf of reinforced concrete as a reliable material, and serve to emphasise the pressing need existing to-day for removal of the obstacles to its employment that are presented in the absurd—because obsolete—stipulations of the London Building Act and other regulations based upon the code therein contained, and also for prompt reversal of the objections entertained by the Local Government Board to the same valuable material of construction.

Municipalities desiring to make application of reinforced concrete are probably in the happy position of being able to relax ordinary building regulations in their own favour, thereby permitting the application of reinforced concrete on economical lines, such as those followed by His Majesty's Government in the case of the new General Post Office buildings, and of numerous structures erected for the Admiralty, the War Office, and other departments.

Ratepayers generally would be glad to have an assurance that municipal buildings of all kinds will be constructed at less cost in the future, but they would be even more rejoiced to learn that the privileges enjoyed by His Majesty's Government and municipal bodies in respect of reinforced concrete will be extended to the public at large.

The London County Council have recently recognised the justice of such a policy by authorising the construction of a large granary building in reinforced concrete in the south of the metropolis, and the Liverpool Corporation have shown themselves equally reasonable in sanctioning the erection of the new offices of the Royal Liver Assurance Co. in the same material, both of these buildings being designed in accordance with engineering principles and regardless of the stipulations originally formulated for brickwork.

*A Paper read at a Conference held in connection with the Municipal, Building and Public Health Exhibition, Agricultural Hall, London, on May 5, 1908.



REINFORCED CONCRETE STRONG-ROOM IN COURSE OF CONSTRUCTION.

Municipal engineering covers so many branches of constructive work as to render futile any attempt to deal adequately in the limited time at disposal with the various opportunities existing for the employment of reinforced concrete in that department of engineering practice.

For the erection of buildings such as hospitals, disinfector and refuse disposal stations, mortuaries, stables, abattoirs, market buildings, baths and washhouses and others that could be cited, reinforced concrete offers advantages from the hygienic standpoint that are possessed by no other material or method of construction, apart from the important questions of economy, resistance to fire, and the elimination of maintenance charges.

Reinforced concrete is also particularly suitable for the erection of industrial dwellings, municipal offices, concert halls, power houses, pumping stations, and in fact for almost every class of building within the province of the municipal engineer. In construction of more exclusively engineering character it is satisfactory to find that reinforced concrete has been very largely employed throughout the United Kingdom in structures such as open and covered waterworks, reservoirs, water towers, sewage tanks, sewers, water conduits, culverts, highway bridges, retaining walls, river walls, as well as in embankments, walls and groynes for coast protection purposes.

REINFORCED CONCRETE STRONG-ROOMS.

Reinforced concrete has been used during the last few years in numerous cases for the construction of safe-vaults or strong-rooms for banks, etc. We illustrate on this page a strong-room in course of construction at an English bank, the location of which we are not permitted to disclose, for obvious reasons. The reinforcement of the walls throughout consists of Indented steel bars, of heavy section arranged in a meshwork as shown, these having been supplied by the Indented Steel Bar Co., Ltd., of Queen Anne's Chambers, Westminster. Such a construction affords very great security, as it cannot be penetrated by any ordinary tools, and explosives would be less likely to effect an entrance than in a steel-protected vault.

Correspondence.

Pile Reinforcement.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—In the paper by Mr. Ernest R. Matthews on "The Use of Reinforced Concrete in Engineering and Architectural Construction in America," published in your issue for April 22nd, we notice that the author states in his description of "Simplex" piles that expanded metal is used as the reinforcement. This statement we desire to modify, as Indented bars have been very largely used in this country as reinforcement for "Simplex" piles; in fact, to the best of our knowledge, no other sort of reinforcement has been used. Yours faithfully,

THE PATENT INDENTED STEEL BAR CO., Ltd.

London.

[The paper in question was read before the Royal Society of Arts, and the statements made are the author's, not our own.—Ed. B.J.]

The Concrete Institute.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—I was much interested to read in your last "Concrete and Steel Section" the particulars of the Concrete Institute, which has now been duly formed and constituted. I feel sure that a great impetus will be given to the subject when the Institute gets into full working order, seeing that the applications of concrete and reinforced concrete are almost unlimited.

I would suggest that as there is so much work to be done along experimental lines, the Institute possibly could arrange that such studies might be taken up where testing machines are located, so as to bring us more into line with other countries, although I fear it will be some time yet before the subject forms part of the everyday curriculum in our educational centres devoted to the technical training of engineers and architects.

Yours truly, J.A.S.

HOLLOW CONCRETE BLOCKS.

Standard Rules and Regulations.

On page 357 of our issue for April 22nd we referred to the rules and regulations for the manufacture of hollow concrete blocks for building purposes drawn up by the American Association of Cement Users. We now give in full these valuable rules, which are the result of much experience :—

Concrete hollow blocks made in accordance with the following specifications, and meeting the requirements thereof, may be used in building construction, subject to the usual form of approval required of other materials of construction by the Bureau of Building Inspection.

1. Cement.

The cement used in making sand blocks shall be Portland cement capable of passing the requirements as set forth in the "Standard Specifications for Cement," by the American Society for Testing Materials.

2. Sand.

The sand used shall be suitable siliceous material, passing the ¼in. mesh sieve, clean, gritty, and free from impurities.

3. Stone or Coarse Aggregate.

This material shall be clean broken stone, free from dust, or clean screened gravel passing the ¾in., and refused by the ¼in. mesh sieve.

4. Unit of Measurement.

The barrel of Portland cement shall weigh 380lbs. net, either in barrels or sub-divisions thereof, made up of cloth or paper bags, and a cubic foot of cement shall be called not to exceed 100lbs. or the equivalent of 3.8 cub. ft. per barrel. Cement shall be gauged or measured either in the original package as received from the manufacturer, or may be weighed and so proportioned; but under no circumstances shall it be measured loose in bulk.

5. Proportions.

For exposed exterior or bearing walls:

(*a*) Concrete hollow blocks, machine-made, using a semi-wet concrete or mortar, shall contain one part cement to not exceeding three parts sand and to not exceeding four parts stone, of character and size before stipulated. When the stone be omitted, the proportion of sand shall not be increased unless it can be demonstrated in each case that the percentage of voids and tests of absorption and strength allow greater proportions with equally good results.

(*b*) When said blocks are made of slush concrete in individual moulds and allowed to harden undisturbed in same before removal, the proportions may be one part cement to not exceeding three parts sand and five parts stone, but in this case also, if the stone be omitted, the proportion of sand shall not be increased, except as specified in (*a*).

6. Mixing.

Thorough and vigorous mixing is of the utmost importance.

(a) *Hand Mixing.*—The cement and

sand in correct proportions shall first be perfectly mixed dry, the water shall then be added carefully and slowly in proper proportions and thoroughly worked into and throughout the resultant mortar; the moistened gravel or broken stone shall then be added, either by spreading same uniformly over the mortar, or spreading the mortar uniformly over the stones, and then the whole mass shall be vigorously mixed together until the coarse aggregate is thoroughly incorporated with and distributed throughout the mortar.

(b) *Mechanical Mixing.*—Preference shall be given to mechanical mixers of suitable design, and adapted to the particular work required of them; the sand and cement, or sand and cement and moistened stone, shall, however, be first thoroughly mixed before the addition of water, and then continued until the water is uniformly distributed or incorporated with the mortar or concrete. Provided, however, that when making slush or wet concrete (such as will quake or flow) this procedure may be varied with the consent of the Bureau of Building Inspection, or the architect or engineer in charge.

7. Moulding.

Due care shall be used to secure density and uniformity in the blocks by tamping or other suitable means of compression. Tamped blocks shall not be finished by simply striking off with a straight edge, but, after striking off, the top surfaces shall be trowelled or otherwise finished to secure density and a sharp and true arris.

8. Curing.

Every precaution shall be taken to prevent the drying out of the blocks during their initial set and first hardening. A sufficiency of water shall first be used in the mixing to perfect the crystallization of the cement, and, after moulding, the blocks shall be carefully protected from wind-currents, sunlight, dry heat, or freezing for at least five days, during which time additional moisture shall be supplied by approved methods, and occasionally thereafter until ready for use.

9. Ageing.

Concrete hollow blocks in which the ratio of cement to sand be one-third (one part cement to three parts sand) shall not be used in the construction of any building until they have attained the age of not less than three weeks.

Concrete hollow blocks in which the ratio of cement to sand be one-half (1 part cement to 2 parts sand) may be used in construction at the age of two weeks, with the special consent of the Bureau of Building Inspection and the architect or engineer in charge.

Special blocks of rich composition, required for closures, may be used at the age of seven days with the special consent of the same authorities.

The time herein named is conditional, however, upon maintaining proper conditions of exposure during the curing period.

10. Marking.

All concrete blocks shall be marked for purposes of identification, showing name of manufacturer or brand, date (day, month, and year) made, and composition or proportions used, as for example, 1-3-5, meaning 1 cement, 3 sand, and 5 stone.

11. Thickness of Walls.

The thickness of bearing walls for any building where concrete hollow blocks are used may be 10 per cent. less than is required by law for brick walls. For curtain walls or partition walls the requirements shall be the same as in the use of hollow tile, terra-cotta, or plaster blocks.

12. Party Walls.

Hollow concrete blocks shall not be permitted in the construction of party walls, except when filled solid.

13. Walls.

Where the face only is of hollow concrete block, and the backing is of brick, the facing of hollow block must be strongly bonded to the brick either with headers projecting 4in. into the brick work every fourth course being a heading course, or with approved ties; no brick backing to be less than 8ins. Where the walls are made entirely of concrete blocks, but where said blocks have not the same width as the wall, where not otherwise sufficiently bonded, every fifth course shall extend through the wall, forming a secure bond. All walls, where blocks are used, shall be laid up with Portland cement mortar.

14. Girders or Joists.

Wherever girders or joists rest upon walls so that there is a concentrated load on the block of over two tons, the blocks supporting the girder or joists must be made solid for at least 8ins. from the inside face. Where such concentrated load shall exceed 5 tons, the blocks for at least three courses below, and for a distance extending at least 18ins. each side of said girder, shall be made solid for at least 8ins. from the inside face. Wherever walls are decreased in thickness, the top course of the thicker wall shall afford a full solid bearing for the webs or walls of the course of blocks above.

15. Limit of Loading.

No wall, nor any part thereof, composed of concrete hollow blocks, shall be loaded to an excess of eight tons per superficial foot of the area of such blocks, including the weight of the wall, and no blocks shall be used in bearing walls that have an average crushing at less than 1,000lbs. per sq. in. of area at the age of 28 days; no deduction to be made in figuring the area for the hollow spaces.

16. Sills and Lintels.

Concrete sills and lintels shall be reinforced by iron or steel rods in a manner satisfactory to the Bureau of Building Inspection, or the architect or engineer in charge, and any lintels spanning over 4ft. 6ins. shall rest on block solid for at least 8ins. from the face next the opening and for at least three courses below the bottom of the lintel.

17. Hollow Spaces.

The hollow space in building blocks used in bearing walls shall not exceed the percentage given in the following table for different height walls, and in no case shall the walls or webs of the block be less in thickness than one-fourth their height, except that the Department of Buildings, architect, or engineer may specially approve thinner construction after having passed the prescribed tests. The figures given in the table represent the percentage of such hollow space for different height walls.

Storeys.	1st	2nd	3rd	4th	5th	6th
1 and 2	33	33	—	—	—	—
3 and 4	25	33	33	33	—	—
5 and 6	20	25	25	33	33	33

18. Application for Use.

Before any such material be used in buildings, an application for its use and for a test of the same must be filed with the Bureau of Building Inspection. In the absence of such a bureau the application shall be filed with the chief of any department having such matters in charge. A description of the material and a brief outline of its manufacture and proportions used must be embodied in the application. The name of the firm or corporation, and the responsible officers thereof, shall also be given, and changes in same thereafter promptly reported.

19. Preliminary Test.

No hollow concrete blocks shall be used in the construction of any building unless the maker of said blocks has submitted his product to the full tests required herein, and placed on a file with the Bureau of Building Inspection, or other duly authorised official, a certificate, from a reliable testing laboratory, showing that representative samples have been tested and successfully passed all the requirements thereof, and giving in detail the results of the tests made.

No concrete blocks shall be used in the construction of any building until they have been inspected and approved, or, if required, until representative samples be tested and found satisfactory. The results of all tests made, whether satisfactory or not, shall be placed on file in the Bureau of Building Inspection. These records shall be open to inspection upon application, but need not necessarily be published.

20. Additional Tests.

The manufacturer and user of such hollow concrete blocks, or either of them, shall, at any and all times, have made such tests of the cements used in making such blocks, or such further tests of the completed blocks, or of each of these, at their own expense, and under the supervision of the Bureau of Building Inspection, as the chief of said Bureau shall require.

In case the result of tests made under this condition should show that the standard of these regulations is not maintained, the certificate of approval issued to the manufacturer of said blocks will at once be suspended or revoked.

21. Certificate of Approval.

Following the application called for in clause No. 18, and upon the satisfactory conclusion of the tests called for, a certificate shall be issued to the makers of the blocks by the Bureau of Building Inspection. This certificate of approval will not remain in force for more than four months, unless there be filed with the Bureau of Building Inspection, at least once every four months following, a certificate from some reliable physical testing laboratory showing that the average of at least three specimens tested for transverse strength comply with the requirements herein set forth. The said samples to be selected by a building inspector, or by the laboratory, from blocks actually going into construction work.

22. Test Requirements.

Concrete hollow blocks must be subjected to the following tests: Transverse, compression, and absorption, and may be subjected to freezing and fire tests, but the expense of conducting the freezing and fire tests will not be imposed upon the manufacturer of said blocks.

The test samples must represent the ordinary commercial product, of the regular size and shape used in construction. The samples may be tested as soon as desired by the applicant, but in no case later than 60 days after manufacture.

Transverse Test.—The modulus of rupture for concrete blocks at 28 days must average 150lbs., and must not fall below 100lbs. in any case.

Compression Test.—The ultimate com-

pressive strength at 28 days must average 1,000lbs. per square inch, and must not fall below 700lbs. in any case.

Absorption Test.—The percentage of absorption (being weight of water absorbed divided by the weight of the dry sample) must not average higher than 15 per cent., and must not exceed 22 per cent. in any case.

23. Condemned Blocks.

Any and all blocks, samples of which, on being tested, under the direction of the Bureau of Building Inspection, fail to stand at 28 days the tests required by this regulation, shall be marked condemned by the manufacturer or user, and shall be destroyed.

24. Cement Brick.

Cement brick may be used as a substitute for clay brick. They shall be made of one part cement to not exceeding four parts clean sharp sand, or one part cement to not exceeding three parts clean sand and three parts broken stone or gravel passing the ½in. and refused by the ⅛in. mesh sieve. In all other respects, cement brick must conform to the requirements of the foregoing specifications.

SPECIFICATIONS GOVERNING METHOD OF TESTING CONCRETE HOLLOW BLOCKS.

1.

All tests required for approval shall be made in some laboratory of recognised standing, under the supervision of the engineer of the Bureau of Building Inspection, or the architect, or the engineer in charge, or all of these. The manufacturer may be present or represented during said tests, if he so desires. Approval tests are made at the expense of the applicant.

2.

For the purpose of the tests, at least twelve samples or test pieces must be provided. Such samples must represent the ordinary commercial product, and may be selected from stock by the Bureau of Building Inspection, or in the absence of such a bureau, by the architect or engineer in charge.

In case where the material is made and used in special shapes or forms too large for testing in the ordinary machines, smaller-size specimens shall be used as may be directed.

3.

In addition to the tests required for approval, the weight per cubic foot of the material must also be obtained and recorded.

4.

Tests shall be made in series of at least three, except that in the fire tests a series of two (four samples) are sufficient.

Transverse tests shall be made on full-size samples. Half samples may be used for the crushing, freezing, and fire tests. The remaining samples are kept in reserve, in case duplicate or confirmatory tests be required. All samples must be marked for identification and comparison.

5.

The transverse test shall be made as follows: The samples shall be placed flatwise on two rounded knife-edge bearings set parallel 7ins. apart. A load is then applied on top, midway between the supports, and transmitted through a similar rounded knife edge, until the sample is ruptured. The modulus of rupture shall then be determined by multiplying the total breaking load in pounds by 21 (three times the distance between supports in inches) and then dividing the results thus obtained by twice the product of the width in inches by the square of the depth in inches $R = 3l\,W \div 2\,b\,d^2$. No allowance should be made in figuring the modulus of rupture for the hollow spaces.

6.

The compression test shall be made as follows: Samples must be cut from blocks so as to contain the full web section. The sample must be carefully measured, then bedded flatwise in plaster of Paris, to secure a uniform bearing in the testing machine, and crushed. The total breaking load is then divided by the area in compression in square inches. No deduction to be made for hollow spaces; the area will be considered as the product of the width by the length.

7.

The absorption test shall be made as follows:—The sample is first thoroughly dried to a constant weight. The weight must be carefully recorded. It is then placed in a pan or tray of water, face downward, immersing it to a depth of not more than ½in. It is again carefully weighed at the following periods: Thirty minutes, four hours, and 48 hours respectively, from the time of immersion, being replaced in the water in each case as soon as the weight is taken. Its compressive strength while still wet is then determined at the end of the 48-hour period, in the manner specified in section 6.

8.

The freezing test shall be made as follows: The sample is immersed, as described in section 7, for at least four hours, and then weighed. It is then placed in a freezing mixture or a refrigerator, or otherwise subjected to a temperature of less than 15 degs. Fahr. for at least 12 hours. It is then removed and placed in water, where it must remain for at least one hour, the temperature of which is at least 150 degs. Fahr. This operation is repeated ten times, after which the sample is again weighed while still wet from the last thawing. Its crushing strength should then be determined as called for in section 6.

9.

The fire test is made as follows: Two samples are placed in a cold furnace, in which the temperature is gradually raised to 1,700 degs. Fahr. The test piece must be subjected to this temperature for at least 30 minutes. One of the samples is then plunged in cold water (about 50 to 60 degs. Fahr.), and the results noted. The second sample is permitted to cool gradually in air, and the results noted.

10.

The following requirements must be met to secure an acceptance of the materials: The modulus of rupture for concrete blocks at 28 days old must average 140lbs., and must not fall below 100lbs. in any case. The ultimate compressive strength at 28 days must average 1,000lbs. per sq. in., and must not fall below 700lbs. in any case. The percentage of absorption (being the weight of water absorbed divided by the weight of the dry sample) must not average higher than 15 per cent., and must not exceed 22 per cent. in any case. The reduction of compressive strength must not be more than 33⅓ per cent., except that when the lower figure is still above 1,000lbs. per sq. in., the loss in strength may be neglected. The freezing and thawing process must not cause a loss in weight greater than 10 per cent., nor a loss in strength of more than 33⅓ per cent.; except that when the lower figure is still above 1,000lbs. per sq. in., the loss in strength may be neglected. The fire test must not cause the material to disintegrate.

Bankruptcies.

During the week ended May 15th, twenty-three failures in the building and timber trades of England and Wales were gazetted.

T. Dawson, builder, Bolton. Liabilities, £1,374; assets, £263.

J. Ennor, Junr., surveyor, Newquay. R.O. and Adj., May 9.

R. G. Minns, builder, Eaton, Norwich. R.O. and Adj., May 9.

J. Knight (trading at Jno. Knight and Sons), builder, Chelsea. R.O., May 9.

W. W. Hutchinson, carpenter and wheelwright, Cambridge. R.O. and Adj., May 5.

J. T. Hughes, contractor and haulier's manager, Wolverhampton. R.O. and Adj., May 4.

J. Phillips, carpenter, wheelwright, and contractor, Great Mongeham, near Deal. R.O. and Adj., May 5.

E. Boulton, plumber, Crewe. First meeting, O.R.'s, Newcastle, Staffs., May 20, at 12. P.E., C.C., Crewe, May 29, at 11.15.

J. S. Hibberd, builder, Frome. First meeting, O.R.'s, Bristol, May 20, at 11.45. P.E., Mechanics' Hall, Frome, June 16, at 11.30.

F. Dando, haulier, Midsomer Norton. First meeting, O.R.'s, Bristol, May 20, at 11.30. P.E., Guildhall, Wells, June 16, at 11.30.

R. Iles and Co., builders, Fulham. R.O., May 8. First meeting, Bankruptcy Court, May 20, at 12. P.E., Bankruptcy Court, June 25, at 11.

T. Reynolds, builder and contractor, Rugby. First meeting, O.R.'s, Coventry, May 18, at 3. P.E., St. Mary's Hall, Coventry, June 1, at 2.30.

T. B. Hughes, builder, Bishopston and Bristol. R.O., May 8. First meeting, O.R.'s, Bristol, May 20, at 12. P.E., Guildhall, Bristol, June 5, at 12.

C. G. St. John, builder, London and Clapham. R.O., March 9. First meeting, Bankruptcy Court, May 20, at 1. P.E., Bankruptcy Court, June 2, at 12.

J. J. Palmer, stonemason, Frodsham. R.O., May 4. First meeting, O.R.'s, Manchester, May 20, at 2.30. P.E., C.C., Warrington, June 5, at 11. Adj., May 7.

W. E. G. Hinchcliffe, wood turner, Menston. R.O., May 2. First meeting, O.R.'s Leeds, May 19, at 11. P.E., C.C., Leeds, May 26 at 11. Adj. May 2.

G. Jackson, plumber, Birkenhead (late Wigan). R.O., May 5. First meeting, 19, Exchange Street, Bolton, May 21, at 3. P.E., C.C., Wigan, June 2, at 2.15.

F. W. Manners, cartage contractor, West Hartlepool. R.O., May 6. First meeting, O.R.'s, Sunderland, May 21, at 3. P.E., C.C., Sunderland, June 4, at 11.15. Adj., May 6.

T. Quartermaine, painting contractor, late of Shoreham and Frimley. R.O., May 6. First meeting, Bankruptcy Court, London, May 16, at 11.30. P.E., C.C., Brighton, May 28, at 11.

A. J. Dacombe, builder, Branksome. R.O., May 4. First meeting, Curtis and Sons, 42, Station Road, Poole, May 20, at 2. P.E., Town Hall, Poole, June 12, at 11.30. Adj., May 4.

A. J. Darlaston, Handsworth (Adj., April 25), and W. Edwards, Nottingham (Adj., May 5), late trading as Darlaston and Edwards, designers and contractors, Birmingham. (Amended notice.)

Dissolution of Partnership.

Hoppers and McArthur (J. R. Hopper, W. H. Hopper, and W. McArthur), builders, West Hartlepool, as from May 5. Debts by and to J. R. Hopper and W. H. Hopper.

Coming Events.

Thursday, May 21.

University of London.—W. D. Scott-Moncrieff, on "The Engineering Aspect of Recent Advances in Connection with Sewering—III.," 5 p.m.

Society of Architects.—Paper by Prof. A. W. Rimington, on "The Use of Colour in Architecture from the Artist's Standpoint." 8 p.m.

Thursday, May 21, and Friday, May 22.

Surveyors' Institution.—Country Meeting at Dover.

Worshipful Company of Carpenters.—Mr. James Bartlett, M.S.A., lecture on "Joiners' Work in a Building—III." 7.30 p.m.

Saturday, May 23.

Architectural Association. — First Summer Visit, to a house designed by Mr. E. L. Lutyens, at Sonning, and the "White Hart" Inn, designed by Mr. W. Campbell Jones.

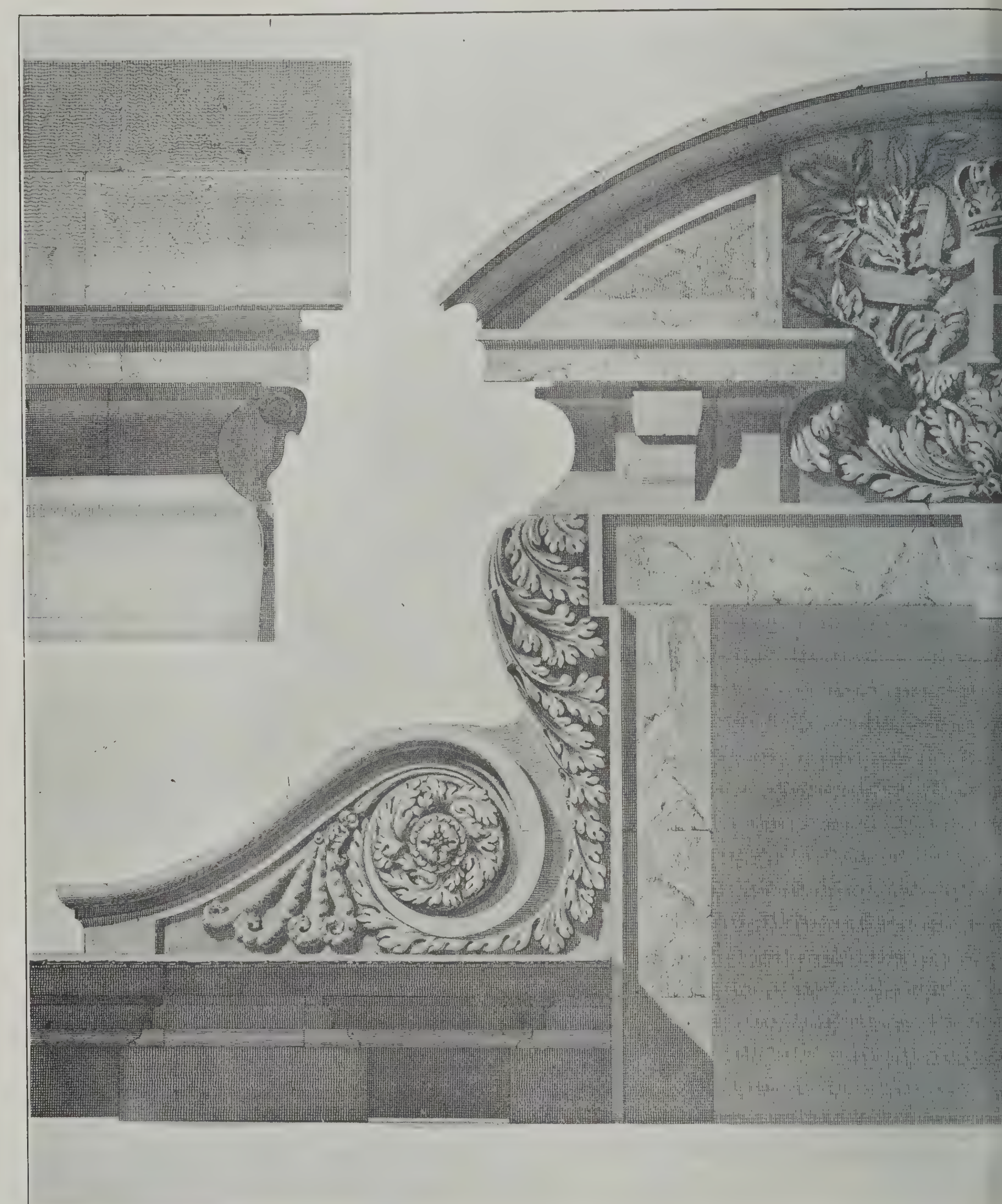
Junior Institution of Engineers.—Visit to Avonmouth Docks, works and electricity works, Bristol.

Institution of Civil Engineers.—Newcastle-on-Tyne Students' visit to Redheugh Gasworks.

Friday, May 29, and Saturday, May 30

Institute of Sanitary Engineers.—Examinations in London, Manchester, and Bristol.

Supplement to THE BUILDERS' JOURNAL AND ARCHITECTURAL ENGINEER, *Wednesday, May 27th, 1908.*



FONTAINEBLEAU: PEDIMENT TO C

AL PAVILION, GALERIE DES CERFS.

Volume 28, No. 6.

May 27, 1908.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

ILLUSTRATIONS.

The House Collapse in Castle Street. Mr. John Burns's reply in the House of Commons to Lord Robert Cecil's question in regard to the recent collapse of two houses in Castle Street, Oxford Street, W., when three persons were killed and several injured, leaves the matter in exactly the same position as it occupied at the close of the coroner's enquiry; that is to say, the cause of the collapse has not been ascertained, despite the investigations which have been made (and are still being made) by the superintending architect of the London County Council, and by the district surveyor concerned with the matter. The latter thinks that leakage from the old drains in one of the houses must have saturated and softened the earth under the walls and angle chimney breast, and also to some extent rotted the lower portion of the same, and he suggests that this may to some extent account for the disaster. He also thinks that a cesspool, which was situate only a few inches from an old angle breast, may also have contributed to it. Having regard to the number of houses in London, some of which are about the same age as those in question, Mr. Burns could not say that it was impossible that an accident might happen elsewhere under similar unforeseen circumstances, but the district surveyors were continually on the look-out for buildings which indicated signs of danger, and Part IX. of the London Building Act, 1894, contains provisions for dealing with such cases. As a matter of fact, accidents of this kind are of very rare occurrence.

Government Proposals in Whitehall. On the second reading of the Public Offices Sites Bill, in the House of Commons, Mr. Lewis Harcourt made a statement regarding the scheme of Government buildings in Whitehall. It was intended, he said, to continue the late Government's plans, which were founded on the report of a committee in 1897. The scheme was to complete the block of new public offices at the corner of Whitehall and Great George Street, as far as St. James's Park, according to the designs of the late Mr. Brydon. In the process they would demolish Delahay Street (which would be no longer wanted as a public thoroughfare), and would also demolish the building of the Institution of Civil Engineers, the Government having made an arrangement to re-house the Institution on the other side of the street (the Institution are accepting, roughly, £40,000 for their building). Power was also given by the Bill to stop up part of a nominal road in Scotland Yard, and an improved thoroughfare would be made through Scotland Yard, leading to Whitehall and the Embankment. He hoped to be able to accommodate on the site a new army recruiting station, and in this way they would get rid of a large remnant of St. George's Barracks, and the recruiting station behind the National Gallery.

A Monumental Chapel to Westminster Abbey. Everyone admits that the interior of Westminster Abbey is robbed of much of its grandeur by the miscellaneous collection of marble monuments and statues to the great dead which have been erected there during the course of centuries. The trouble is to devise some remedy which will effectually prevent further encroachment. Lord Eversley is to put a question about this matter in the House of Lords to-day. He will ask the Government, in view of the recommendation of the Royal Commission of 1890, that an addition should be made to the Abbey for the purpose of providing space for continuing the historical roll of monuments, and, in view of the fact that the Commissioners were evenly divided in opinion as to the mode of effecting this, whether they will appoint another Commission to consider the subject. As mentioned in the "Times," the Royal Commission of 1890 consisted of Lord Rathmore, who was the chairman, the Dean of Westminster, Lord Leighton, Sir Henry Layard, Mr. Louis Jennings, M.P., and Mr. Waterhouse. Three of the Commissioners proposed that a monumental chapel should be erected in Old Palace Yard, communicating with the Abbey by cloisters running under the buttresses to the chapter-house; while the other three were in favour of erecting a chapel in the cloisters on the site of the old refectory. The objection to the first proposal came from Mr. Labouchere, who then occupied what is now the Royal Commission House in Old Palace Yard. The Treasury subsequently purchased Mr. Labouchere's house, and agreed, in conjunction with the Ecclesiastical Commissioners, to demolish the buildings standing between the Abbey, the chapter house, and Mr. Labouchere's residence. This scheme was carried out at a cost of £60,000. There is now no objection on the ground of private vested interest to prevent a monumental chapel being built in Old Palace Yard; and the suggestion is made that such a chapel, if erected, might be called the Edward VII. Chapel.

The Builders' Benevolent Institution. When presiding at the festival dinner of the Builders' Benevolent Institution held on November 28th last Mr. Fredk. Higgs, the president, made the statement that, assuming the annual subscriptions to equal and the outgoings not to exceed those of the previous year, £1,336 would be required to make both ends meet during his period of office. Owing to the generosity of friends and supporters, he was able to announce a total contribution of £1,141, leaving a deficit of £195. With the end of the official year (June 30th) in sight, an approximate estimate of the financial position can be made, and from this it appears that the annual subscriptions will fall short by £75, while the outgoings will exceed by £56, those of 1906-7. These deficits added together leave £326 to be secured in order to establish a financial equilibrium. An appeal for funds is therefore being made on behalf of this worthy institution, which we commend to the attention of our readers. All contributions should be sent to Mr. Higgs, at Station Works, Hinton Road, Herne Hill, London, S.E.

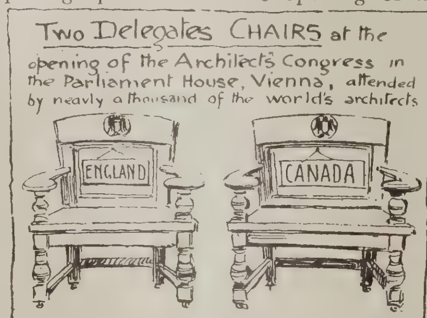
The Preservation of Steel Embedded in Concrete. On several occasions we have pointed out that steel embedded in concrete is preserved against rust and corrosion, being found intact, and free from scale, after many years. The latest proof of this assertion is found in a report on some tests made by Dr. Glazebrook, director of the National Physical Laboratory, which report has just been communicated to the "Times" by Sir John Brunner, at whose request the experiments in question were undertaken. The report is as follows:—"A strong wooden box was made and divided into five partitions, each partition being 12ins. long, 7½ins. wide, and 7½ins. deep. Specimens of mild steel of the following dimensions were prepared:—(1) 1in. diameter, 8ins. long, turned all over. (2) 8in. lengths cut from a 1½in. by 1½in. bar, with the scale left on. The partitions were half-filled with good Portland cement concrete, and a specimen of each kind laid on the top, and the partitions were then filled up. This was done on December 21st, 1906. The blocks were covered with water several times a week for a year, and for three months afterwards were left in the open, subject to the weather. On April 20th one of the blocks was removed from the box and broken up, and the specimens removed. On examining the specimens carefully,

no trace of any action by the cement could be detected. The turned specimen was practically as bright as when it was put in, and the scale on the rough specimen was undisturbed. To test the possibility of any slight action, the surface of the turned specimen was polished and etched and examined under the microscope side by side with a specimen of the same material cut from the centre of the bar. No difference in the micro-structure of the two specimens could be detected, and the conclusion is that in 16 months no action has taken place between the metal and the concrete. It is proposed to immerse one of the remaining blocks in the comparatively warm water of the cooling pond for six months, and then to examine the specimens."

Notification of Building Accidents. The abstract of the Factory and Workshop Acts of 1901 and 1907 has been reprinted by the Home Office for the use of builders, and can be obtained by post from any of the Government printers at a cost of 3½d. While only an abstract, sufficient detail is given in it to enable a contractor clearly to understand his liabilities under the Acts mentioned. The reprint has been rendered necessary owing to various changes in the law resulting from amending Acts, the most important, perhaps, being the notification of accidents. As has previously been the case, fatal accidents have to be notified to the district factory inspector and also to the appointed certifying surgeon, but with regard to non-fatal accidents some alterations may be mentioned. Notice has now to be sent to the inspector if the accident is sufficiently severe to keep a workman away from his work for more than seven days, instead of a period of five hours, on any one of the three days next following the accident, as formerly. There is an exception, however, if the accident is due to machinery moved by mechanical power, to molten metal, hot liquid, explosion, escape of gas or steam, or electricity; then the notice must be forwarded if the injured person is away for more than one day, and in these cases the certifying surgeon must also be informed. Apart from these alterations, certain dangerous occurrences have now also to be notified, whether personal injury is caused or not. The particular dangers mentioned for this purpose are the bursting of a revolving vessel, wheel, emery wheel, or grindstone, moved by power, or the breaking of any appliance used for raising or lowering persons or goods with the aid of power. So far so good, but the real item which will undoubtedly command universal attention is printed as a note in one corner of the abstract. It reads as follows:—"Where this abstract is posted up in the open air, it is suggested that it should be pasted on a board or a sheet of tin or zinc, and should be protected by two coats of clear varnish. *A coat of size or very thin glue should be applied before the varnish.*" This to a builder! (The italics are ours.)

More Legislation for the Building Trade. On Thursday, May 14th, the Home Secretary, in answer to a question put to him by Mr. Arthur Henderson as to when the proposed building regulations were to come into force, replied that before that could be done further legislation would be necessary, and he announced his intention to proceed in that direction during the present sessions. It is, of course, impossible to prophecy what particular direction the new Bill will take, but it is perhaps safe to think that a wider application of the present Factory Act will result. As is well known, some buildings do not now come within the Home Office jurisdiction, notably those under 30ft. in height, and upon which machinery is not being used. That all buildings will be taken into the net is possible, and also perhaps those in course of demolition. The Home Office interest in buildings is entirely limited to the prevention of accidents, and from this point of view there can be little objection to reasonable legislation; but the Home Office action, if it follows the ordinary course of legal promptitude, may arrive too late.

The Vienna Congress. An English architect attending the International Congress at Vienna has sent us the sketch reproduced below. At the time of writing we do not know the reason for these empty chairs, though possibly it may be ascribed to what we are informed has been "a general muddling-up of the arrangements so far as the English visitors are concerned"; but, whatever the reason, the absence of the delegates in question is much to be regretted. On the next page we give a photograph taken at the opening of the



Congress. This, we think, will be studied with much interest. One thing in particular it shows is the splendid apartment in which the meetings have been held. The Parliament House of Vienna and the Institute room at 9, Conduit Street offer a suggestive contrast; though the Congress, other than a social function, is not likely to be of more value in one place than in another. As we had occasion to point out in 1906, when the Congress was held in London, the opening meeting at the Guildhall, being one of the big social events, was crowded to the doors, whereas at the meetings when ostensibly the existence of the Congress was made manifest there was only a mere handful of members—most of them too much bored to be interested, and too polite to show the boredom which they could scarcely conceal. Let the truth be told: the Congress in London was a farce; though we have no doubt the visitors enjoyed themselves very much outside, looking at our buildings, talking to our architects, attending receptions and fêtes, taking part in excursions, and generally enjoying themselves. And we have no doubt that the English visitors to Vienna have had just the same experience.

The Shortage of Timber. Afforestation is in a fair way to become the movement of the moment. In the House of Commons last Thursday, taking advantage of the opportunity afforded by a vote for the salaries and expenses of the Irish Agricultural Department, Mr. W. Redmond called attention to the question of afforestation in Ireland. The Departmental Commission which had enquired into the matter had, he pointed out, reported with absolute unanimity in favour of something being done in order to preserve existing forests, and to provide for fresh plantations, and he wanted to know what steps would be taken in furtherance of these objects. Four other Irish members supported Mr. Redmond's appeal; and, in reply, Mr. Russell, vice-president of the Department of Agriculture and Technical Education, admitted the urgency of afforestation, and added that unless something was done speedily the opportunity for action would be lost, as the necessary land was being rapidly sold. He hoped to be able to persuade the Treasury that the money they had spent on the Commission would be wasted unless they spent some more on giving effect to the recommendations. On the same day on which the report of this discussion appeared, the Press made public the annual report of the Midland Re-afforesting Association, in which the hope is expressed that during the present year the Association would be able to plant 14,000 acres of waste. Sir Oliver Lodge, who presided at the annual meeting, which was held at Birmingham University, said that with the help of the Association the Black Country might in time become green, and trees like the alder, wych-elm, ash, sycamore, willow, and black poplar might cover all its 28,000 acres of waste, which were chiefly the spoil banks of collieries and the slag heaps of blast furnaces. That indeed would be a great achievement, worthy of a great effort.

Correspondence.

The Institute Elections.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—May I ask you to be good enough to find me space in the columns of your paper to appeal to all the "Fellows" and "Associates" of the R.I.B.A. in connection with the balloting papers which have been sent out to them by the Institute. At last we have a chance of showing the council that we do not approve of the manner in which gentlemen are elected "Fellows" without passing the examination qualifying them for the Associate class. Out of 23 names put up for election, there is only one who has passed the examinations and qualified as an Associate. Why should this sort of thing be allowed? I do most earnestly hope that all those who have the power, and the privilege, to vote will do so. Every vote that can be obtained is necessary.

Yours faithfully,

"ASSOCIATE."

ROADMAKING EXPERIMENTS ON THE EMBANKMENT. — In April last the London County Council, having under consideration the repaving of the Embankment roadway, decided to accept the offer of the Trinidad Lake Asphalt Paving Co., Ltd., to lay 7,000 sq. yards of tar macadam at the rate of 9s. per sq. yd. The Roadamant Co., Ltd., has now offered to lay 700 sq. yds. of their patent "Roadamant" paving at the rate of 8s. per sq. yd., this price to include maintenance for two years, and the company undertake that, should the paving prove a failure, they will refund to the Council the moneys expended, and remove the paving, replacing it with macadam. The Highways Committee recommend that this offer be accepted.

Photo: Topical Press.

THE OPENING OF THE EIGHTH INTERNATIONAL CONGRESS OF ARCHITECTS IN THE PARLIAMENT HOUSE, VIENNA, ON MAY 18, 1908.

THE ARCHITECTS' CONGRESS AT VIENNA.

The Congress which took place in Vienna last week was attended by about 1,200 architects of all the leading nationalities, and whilst the technical value of the majority of the papers and discussions was small, the occasion afforded an opportunity for an informal interchange of views between the professional men present, particularly between the German-speaking visitors, *i.e.*, the Germans, Austrians, Russians, Dutch, and Scandinavians.

It was difficult to gauge the exact number of British and Colonial architectects present, as their arrangements lacked organisation, but probably from forty to fifty attended. It was unfortunate, however, that no British Government department was represented, nor was there any official delegate from the Royal Institute of British Architects. Omissions of this descripton do not assist in raising the prestige of a nation, especially when the Government departments of practically every other country are represented, and all the leading interests of the world have their accredited delegates. No Colonial Government department was even officially represented, although Colonies such as Canada are generally most punctilious in such matters. We were pleased to see, however, that there were accredited delegates from the Cape Institute of Architects, the Transvaal Institute of Architects, the Architects' Association, Quebec; the Institute of Architects of Canada, and the Ontario Association of Architects.

Of English architects in attendance in their individual capacity, or as members of the International Council of Architects, there were, among others, Mr. Ernest George, Mr. Leonard Stokes, Mr. J. W. Simpson, Mr. A. W. S. Cross, Mr. E. A. Rickards, Mr. Edwin O. Sachs, Mr. E. Guy Dawber, Mr. Arthur Marshall, Mr. John Murray, Mr. Max Clarke, and Miss Charles.

The absence of either an official delegate of the Royal Institute or a Government delegate, led to England being the only great power of which no representative spoke at the opening meeting, which was an exceedingly impressive function at the Parliament House, and at which it was interesting to hear among the speakers men of the standing of Cuypers (for Holland), Domay (for France), Hinkledyn (for Germany), Kutnor (for Russia), and Totton (for the United States).

The most pleasing feature of this great gathering in the Austrian Parliament House was not so much the value of the actual speeches, as

the Unanimity of Expression

among the official representatives of all the countries who spoke as to the necessity of improving the architectural treatment of our great cities, the raising of the status of the architect, and a definition of his position, and the desire for the creation of official departments concerned specifically with architectural as distinct from what was termed the "routine" execution of public works.

A list of the resolutions passed at the various meetings will be published in due course. In one or two instances it was pleasing to note that different Governments had already made use of the resolutions of the previous Congress, by advancing legislation in their own countries.

The Discussion on Technical Subjects.

Of the technical problems considered, we think we can safely say that the reinforced concrete discussion was perhaps the most animated and useful, and it is to be hoped that the resolution calling for reports of accidents in all classes of buildings (as distinct from reports of accidents in reinforced concrete structures only) will be beneficial in showing what a small proportion of failures actually occur with reinforced buildings as compared with other buildings. Several of the official delegates present have already made arrangements for such reports to be issued by next year.

The Entertainments.

The entertainments in connection with the Congress were lavish to a degree, and extremely well arranged. For instance, a banquet with 1,400 covers, given in the Town Hall by the Municipality, when no fewer than 1,200 were seated in one room, was a function of quite exceptional character.

The excursions to the hills and to some of the old chateaux were most interesting, the facilities afforded for visiting public buildings and attending performances at the Court theatres were useful, whilst a court function at the Old Hofburg Palace, if not particularly exhilarating, gave éclat and Royal patronage to the gathering

As we have indicated on other occasions, congresses of this type must not be judged so much by their technical value, for they are much too unwieldy to do any real good work, but sub-committees, resulting from these congresses, occasionally do much that is practical, and above all these congresses serve as a rendezvous for the architects of all nations for the interchange of experience and pleasurable acquaintanceship.

The Congress Exhibition.

In connection with the Congress, an important architectural exhibition, excellently arranged in rooms covering an area approximately identical with the whole of the principal rooms at Burlington House, served as a most interesting record of the progress made in Continental and American architecture. We say Continental and American architecture advisedly, for the small proportion of British exhibits was eminently unsatisfactory. A few antiquated drawings in tarnished gilt frames, and a collection of photographs of very moderate value, had, deservedly, the worst position of the Exhibition accorded them, in a small room in a far-off corner!

British architects may not agree with the exaggerations and monstrosities of the so-called "Art Nouveau" group of some of their Continental colleagues, but all must have admired the excellent arrangement and representative character of the exhibits presented at this Exhibition.

This sundial was made by Messrs. Thomas Elsley, Ltd., after the design of the architeet of the buildings, Mr. A. W. S. Cross, M.A., F.R I.B.A. The figures and letters are gilded.

LEAD SUNDIAL ON ALMSHOUSES FOR SHOREDITCH CHARITY TRUSTEES, WOOD GREEN LONDON, N.

ELECTRICITY IN BUILDINGS.

By Harold Hastings, M.I.E.E., A.M.Inst.C.E.

In order to study the application of electricity in buildings, it is necessary to have a slight knowledge of some of the most common units in vogue, and to understand the properties of an electric current. The writer proposes therefore to sketch, in a popular form, the principles upon which the study of electricity is based, and the methods by which it is possible to generate a current and to control it. Afterwards its application to buildings will be discussed, and a description given of the methods of installation.

Electricity is present in everything. It is capable of movement, and, for the purpose of this article, may be considered as a weightless fluid which will flow through metals and liquids with ease, but through gases, cotton, silk, indiarubber, glass, and other substances, only when given a great impulse. The former are called "conductors" and the latter "dielectrics." It can be made to flow through any substance, and we shall find later that its flow through even so good a dielectric as indiarubber can be measured with delicate instruments. On the other hand, there is no conductor, however good, that does not offer some resistance to its flow.

Conditions of Flow.

As electricity pervades all matter, it is necessary, in order to create a flow, to withdraw it from one place and to add it to another. A flow will then be produced between the two places, continuing until balance is regained. If the withdrawal continues, the flow will continue; and if the alteration in balance is carried out at one point in a conductor which returns upon itself and forms a complete circuit, the flow will take place through the rest of the circuit. In Fig. 1, A B C is a circuit of conducting material, such as copper, surrounded by a dielectric, such as air, and having an apparatus at A B which can create a surplus of electricity on the A side at the expense of the B side of the machine. Since the fluid is weightless and can flow through anything, it flows through both air and copper in its passage from A to B; but air, being a gas, is a poor conductor, and the flow will be almost wholly confined to the copper path. Text-books frequently state that "electricity always chooses the easiest path"; it is more correct to say, however, that electricity chooses every path, but divides itself among them, each conveying an amount in proportion to the conductivity.

Relative Conductivity.

It is necessary to dwell upon these points at some length, as they form the basis of the proper understanding of future considerations. We have mentioned relative conductivity. This indicates that some conductors offer more resistance to the passage of the electric current than others. Resistance is one of the properties of conductors that largely affect house-wiring, as it needs energy to overcome it, and the energy exerted against it is evident in the form of heat. If, therefore, the conductor were one of considerable resistance, and the energy required to overcome it were excessive, the amount of heat generated might be sufficient to cause a fire.

A convenient analogy to the flow of an electric current in a conducting circuit is the flow of water through a pipe. Imagine a centrifugal pump drawing water from a tank through one pipe and

FIG. 1.

returning it through another. The energy exerted by the pump, once the flow is started, is practically only that which is required to overcome the resistance of the pipe. As it is a law of nature that no energy is lost, the amount expended by the pump must reappear somewhere. It really goes to heat up the pipe, heat being produced by the friction between the water and the iron. It radiates so quickly, however, that it is not measurable. If the rate of flow were increased by running the pump at an enormous speed, and, further, if the pipe were lagged to prevent rapid radiation, it would become heated to a sufficient degree to be noticeable.

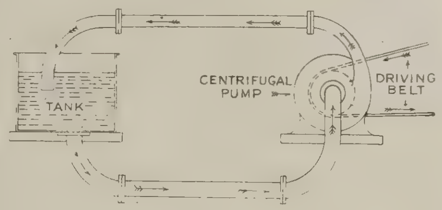


FIG. 2.

This is what occurs in an electric circuit where the resistance and the rate of flow are ill-proportioned. The electric conductor is lagged, moreover, since the most common dielectrics are also bad conductors of heat.

To represent the continual flow proceeding through the dielectric itself, we should have to imagine a very porous pipe allowing the water to percolate through its pores.

Now, consider the tank removed and the suction and delivery pipes connected to a second centrifugal pump, in such a manner that the suction pipe of the first pump is the suction pipe of the second. If the first pump is revolved, the second will act as a turbine and will revolve also, being almost in unison with the first. The slight difference in speed will be accounted for by losses in friction and water slipping past the blades. The second pump could be used for driving machinery—in fact, for doing useful work. This is an excellent analogy of a dynamo driving a motor, and we have chosen centrifugal pumps to illustrate the mutual action. If either pump be revolved, the force will be transmitted to the other. In the case of a dynamo and motor, the name differs according to whether it is creating a flow of electricity, or whether it is being revolved by an electric current.

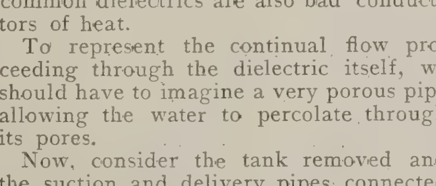


FIG. 3.

In another point the analogy also applies. If a tap be inserted in the pipe, a material which will not allow water to pass is placed across the bore of the pipe. Similarly, a switch in an electric circuit is an apparatus for completing the conducting path when it is "closed"; but when "open" it allows a non-conducting material (namely, air) to intervene in the path.

It will readily be understood now that, no matter what creates a flow of electricity, it must have a complete conducting path through which to travel. Not only so, but it must be kept to the path through which it is required to do work by a sheath of dielectric material of such a nature that the amount of leakage through the covering is negligible. Each circuit must consist of at least two conductors—one for the flow and one for the return.

Units.

We have also seen that the heat generated in a conductor depends upon the resistance. The resistance obviously decreases as the cross-sectional area of the conductor increases. The amount of current passed depends upon the pressure applied, as well as upon the resistance. Hence three distinct units are required—the units of quantity, pressure, and resistance. They correspond in the analogy with gallons per second, pounds per sq. in. (or "head"), and friction between the water and the pipe. The electrical unit of current is the "ampere," that of pressure is the "volt," and that of resistance is the "ohm." The names were taken from the early pages of electrical history, and constitute everlasting mementos of great discoverers.

Voltage and Resistance of Lamps.

As the names of units convey nothing to the lay mind, it is necessary to apply them to some common apparatus, so that they may assume definite shape. The most common pressure of supply for lighting purposes is 200 volts. The most common size of lamp in use for house lighting is one giving 8 candle-power of light. Such a lamp has a resistance of 1,200 ohms when alight, and allows $\frac{1}{6}$th of an ampere to pass through it. An ordinary electric bell battery gives a pressure of $1\frac{5}{8}$ volts for each cell it contains. Two cells are generally sufficient for short bell circuits, so that we find $3\frac{1}{4}$ volts the usual pressure for bells. About 130 yds. of No. 16 gauge copper wire give a resistance of one ohm, and 75 yds. of No. 18 gauge give the same result.

The units have been so chosen that there is a definite relation between them. In a simple circuit, where the applied pressure is one volt and the resistance is one ohm, a current of one ampere will flow. If the pressure is raised to two volts the amperes will be doubled. It must be borne in mind that the word "ampere" really means a certain quantity of electricity per second. It is necessary to introduce time as, in the case of our analogy, a flow of gallons would be meaningless without knowing the time in which a definite number of gallons passed through one particular portion of the pipe.

Ohm's Law.

We have explained that the three units —current, pressure, and resistance—have been chosen in such a manner that they bear a direct relation to one another. This relation has been called "Ohm's Law," after the inventor who first demonstrated it. This law is expressed as an equation $C = \frac{E}{R}$ when the current is C, the pressure E, and the resistance R.

By using this formula we can always find any one value when the other two are given. Thus, in a circuit having 12 ohms resistance, we can find how many amperes will pass with a pressure of 24 volts by dividing 24 by 12. This is simply the "rule of three."

C

When the resistance of a dielectric is being measured, the results assume such huge proportions that a special word—"megohm"—has been invented, meaning one million ohms. The dielectric resistance of a mile of rubber-covered wire is commonly as much as 5,000 megohms. This is usually termed the "insulation resistance," The meaning of the word "insulation" is the complete covering of a conductor with a dielectric.

It will be seen how small a leakage of current takes place between insulated conductors, since, on a 200-volt supply, an installation having only one megohm insulation resistance will allow .0002 amperes to flow through the dielectric. This is calculated by Ohm's law, thus:

$C = \frac{E}{R}$ and $E = 200$ volts, $R = 1{,}000{,}000$ ohms, therefore $C = \frac{200}{1{,}000{,}000} = {\cdot}0002$ amperes.

$C = E/R$, and if two equal amounts are multiplied by the same quantity the results will also be equal.

Therefore $C \times R = E/R \times \frac{R}{1}$ and in the latter amount the Rs cancel, so that $C \times R = E$.

For the benefit of those whose algebra has become rusty, let us take a numerical example, say $6 = 12/2$.

Multiply each quantity by 2, then $6 \times 2 = 12/2 \times 2/1$.

The 2s cancel out in the latter expression and leave $6 \times 2 = 12$. Similarly, $C \times R = E$.

Watts.

A "watt" is another important unit. It is the product of one ampere multiplied by one volt. This is the unit of energy. To continue the analogy of the water pipe, one gallon per second will overcome a definite resistance of pipe with a head equal to a pressure of 3lbs. per sq. in. In maintaining this flow a definite amount of work is done, and a definite amount of energy exerted. This energy is obviously dependent upon the quantity to be passed per second, and the pressure applied to pass it. A new name might be given to one gallon per second multiplied by one pound per sq. in., and this would be a unit of energy. Similarly, one ampere × one volt may be named one "watt," and this will be the unit of electrical energy.

The amount of energy required by an 8 candle-power lamp is 30 watts. This would be attained on a 200-volt circuit with a current of $\frac{1}{6}$ ampère, or upon a 100-volt system with $\frac{1}{3}$ ampère. One electrical horse-power (E.H.P.) is 746 watts. This figure is a useful one when calculating the size of an engine required to drive a dynamo for a complete installation.

A "kilowatt" is 1,000 watts, and one kilowatt of electrical energy exerted for an hour is one "Board of Trade Unit" (B.T.U.), by which unit consumers are charged. The maximum legal charge for the B.T.U. in England is 8d., but the prices commonly charged are between 4d. and 6d. for lighting, and 1d. to 3d. for power.

Leakage.

Returning for a moment to the question of leakage through the insulation of wires, we found that a leakage through one megohm amounted to .0002 ampères. The energy lost will therefore be .0002 × 200 volts = .04 watts. This amount is so small that it can well be neglected. On the other hand, it is interesting to note that even these small currents can be measured with accuracy with simple and comparatively inexpensive apparatus.

A continual waste of this amount would take over three years to consume one B.T.U., and consequently costs less than 2d. a year.

The Amount of Current that may be Carried with Safety.

It has been found that the current which can flow through a conductor without unduly raising the temperature is approximately 1,000 ampères per sq. in. of sectional area. This amount may be considerably exceeded in small sizes, since radiation is more rapid, owing to the greater surface exposed in comparison with the weight of metal. For the same reason it is more advantageous to use a stranded conductor rather than a solid one.

A table will be given later showing the exact amounts that may be safely passed through conductors of various sizes. In the meantime, we will use the approximate rule of 1,000 ampères per sq. in. The resistance of a wire varies with its section, and the current also varies accordingly, so that it is possible to find a relation between the resistance and the current. What we want to find is a relation between the pressure wasted in forcing the current through the wire and the wire itself. This is found to be such that the loss in volts in any size of pure copper conductor is $25\frac{1}{3}$ volts per 1000yds. when the current flowing is 1,000 ampères per sq. in. A No. 18 S.W.G. wire has a sectional area of .0018 sq. in., so that with 1.8 ampères flowing, the loss will be $25\frac{1}{3}$ volts in a length of 1,000yds. A No. 16 wire is .0032 sq. in., and the loss will be the same, in an equal length, with 3.2 ampères flowing. In the same manner a stranded cable can be easily calculated. A 19-16s. (19 strands of No. 16 gauge) will carry 19 times as much current as a single strand, with the same loss per 1,000 yds. By the simple application of the "rule of three," the loss in volts of any conductor can be found when the current, section and length are known. The result is only approximate by this method, but it is sufficiently near to be of practical use. In house-wiring mathematical exactness is not a requisite.

To satisfy those who wish to know the degree of accuracy attained by this method, the exact sectional areas and resistances of the three examples mentioned, are here given. From these the exact loss in volts can be calculated by Ohm's law, thus:—

$C \times R = E$

S.W.G.	Sectional area in sq. ins.	Current at 1,000 amps per sq. in.	Ohms resistance per 1000yds.	Loss in volts per 1000 yds.
18	.001809	1.809	14.023	25.367607
16	.003217	3.217	7.886	25.368262
19/16	.062400	62.4	.407	25.3968

(*To be continued.*)

New Stores at Middlesbrough have been completed for Messrs. Bolckow, Vaughan and Co., Ltd., from designs by Messrs. Bottomley, Son and Wellburn, architects, of Middlesbrough and Leeds. The fire-resisting floors are on Messrs. Homan and Rodgers' system.

Drury Lane Theatre Reconstruction.—The reconstruction of the portions of Drury Lane Theatre damaged by the recent fire is about to be commenced, and, it is hoped, will be completed in time for the autumn drama. The architect is Mr. Pilditch, who designed the previous reconstructions and additions.

Notes and News.

A Large New Drill Hill is proposed to be erected in Cathays Park, Cardiff, at an estimated cost of £20,000.

* * *

Cheshire County Council decided on May 22nd to increase their expenditure on main roads by nearly £8,000, to cope with extra wear and tear caused by motor traffic.

* * *

A Gas Explosion occurred last Friday at the Ironmongers' Hall, Fenchurch Street, while about a score of decorators were at work on the building, and one of them was rather severely burnt.

* * *

A Monument to Sir Henry Campbell-Bannerman, to be erected in Westminster Abbey, was proposed by the Prime Minister in the House of Commons on May 18th. The resolution, which was supported by Mr. Balfour and Mr. J. Redmond, was agreed to unanimously.

* * *

City Architect for Sheffield. — An advertisement for a city architect for Sheffield in now published. The salary offered is £650 per annum. Applications, on a form to be obtained from Mr. R. M. Prescott, Town Clerk, Town Hall, Sheffield, are to be delivered on or before Tuesday, June 2nd.

* * *

An Exhibition of Photographs and Drawings of architectural and decorative art from English cathedral cities and from northern and southern Italy, by Mr. William Davidson, was opened recently at the Outlook Tower, Castlehill, Edinburgh, by Sir R. Rowand Anderson, who paid a great tribute to Mr. Davidson's ability as a draughtsman and a colourist.

* * *

The Northern Architectural Association recently paid a visit to Sunderland, where they inspected the new church at Roker which has been built from designs by Mr. E. S. Prior, and subsequently went over the new Roker Pier to the lighthouse, after which they examined the new south protecting pier, in course of construction.

* * *

A Day Technical School is proposed to be established at the L.C.C. School of Building. Pupils will be required to be between the ages of 13 and 15 on July 31st of the year in which they are admitted to the school. The course of instruction will cover three years. The suggested fees are as follows:—First year, 10s. a term (£1 10s. a year); second and third years, artisan course, 10s. a term (£1 10. a year); professional course, £1 10s. a term (£4 10s. a year); pupils whose parents are in receipt of less than £160 a year to be admitted free.

* * *

The Institute of Metals.—This new institute is proposed to be founded with objects similar to those of the Iron and Steel Institute, namely: (1) To advance our knowledge of the non-ferrous metals and their alloys, more especially copper, zinc, tin, etc.; (2) to publish twice a year a volume of abstracts of papers and books on metallurgical subjects; (3) to afford a means of communication between members of the trades concerned, excluding all questions connected with wages and trade regulation; and (4) to arrange periodical meetings for the discussion of the manufacture, working-up, and use of the non-ferrous metals. A special

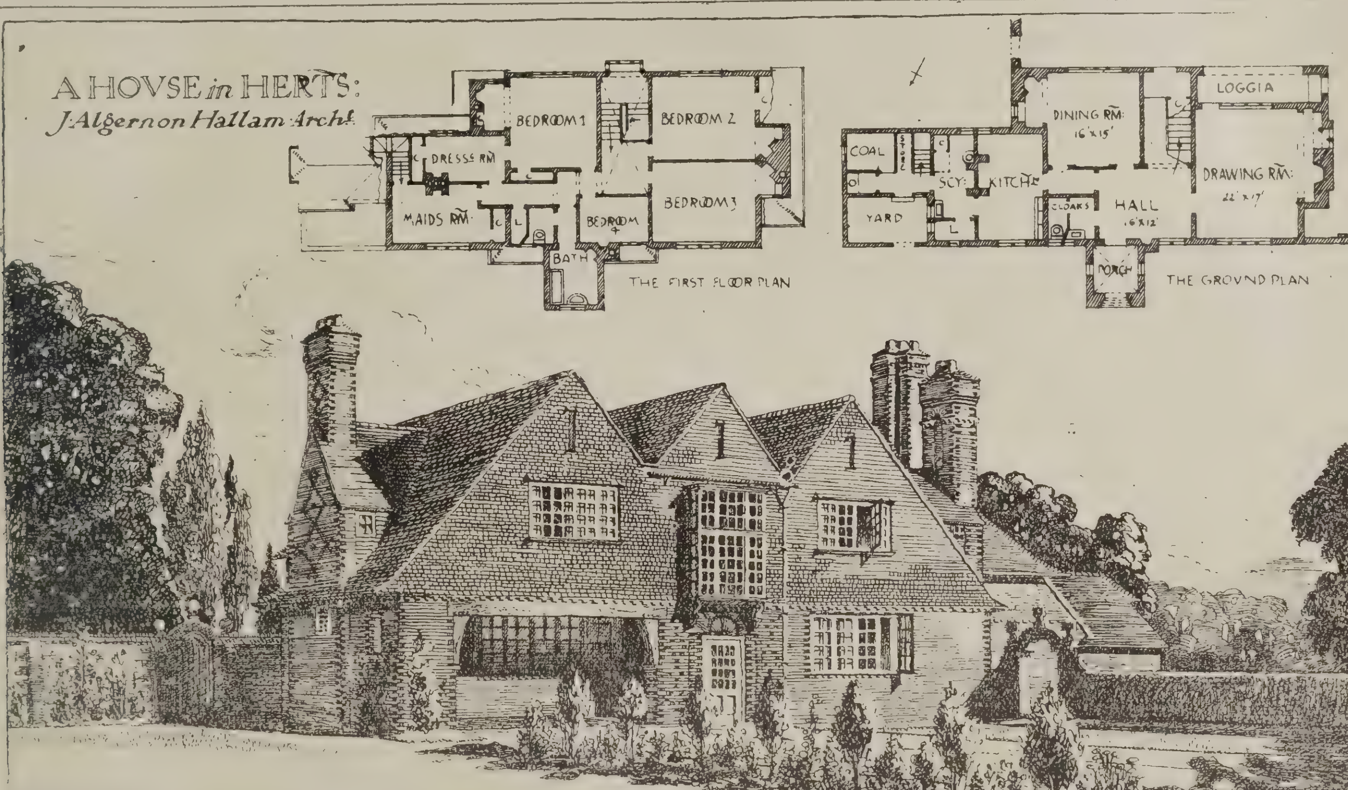
meeting will be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, on June 10th, at 2.30 p.m., when it is hoped to formally constitute the proposed institute. All interested in the matter are requested to attend. Communications should be addressed to Mr. William H. Johnson, c/o Messrs. Richard Johnson, Clapham, and Morris, Ltd., Manchester.

Law Cases.

THE ACTON MUNICIPAL BUILDINGS ACTION: JUDGMENT FOR THE ARCHITECT.—At the resumed hearing, on Thursday last, by Mr. Justice Lawrence, without a jury, of the action brought by Mr. William George Hunt, an architect, to recover remuneration in respect of plans prepared for the erection of municipal buildings at Acton, judgment was given in favour of the architect. The defence was that there was no contract sealed by the defendant Council, who had been elected since the scheme, or whether it was a modification of the original scheme, which it was in the right and power of the architect to do under the terms of his employment. In his judgment it was a modification of the original scheme, and not a new scheme, and therefore the plaintiff was entitled to the amount he claimed. Judgment was then given for the plaintiff for £800 and costs. A stay of execution was granted on condition that the sum of £400 was paid into Court within ten days.

THE AUSTRALIAN PAVILION AT THE FRANCO-BRITISH EXHIBITION. — In the Chancery Division on Friday last, Mr. Justice Joyce heard a renewal of the application in the case of *Coghlan* v. *Kiralfy and others*, relating to an erection which had been set up at the Franco-British Exhibition on a vacant plot opposite the facade of the Australian Colonies Pavilion. Mr. Hughes, K.C., for the applicants, said that the parties had been unable to come to terms. It appeared that the pavilion was at the north end make an order for a mandatory injunction on these materials. Ultimately it was decided that the matter should be referred to an arbitrator to be appointed by the Duke of Argyll, in order to ascertain the compensation, if any, to which the plaintiffs were entitled.

PLUMBER'S UNSUCCESSFUL CLAIM FOR COMPENSATION.—At Birmingham County Court, on May 18th, George James, journeyman plumber, sought to recover, under the Workmen's Compensation Act, from Austin Day, builder and contractor, compensation for injuries sustained in an accident that occurred to the applicant while he was working for the defendant. It appeared that applicant was actually engaged for the work by Thomas Price, master plumber, who was joined as third party in the action. When the accident happened, James was doing some lead-flashing on the roof of a villa, and was using a scaffold formed of a ladder and a trestle. The trestle broke, and James fell a distance of 10ft. or 12ft., sustaining



This house has been planned to give a fair-sized living-room with a smaller dining-room. The bricks will be of a dull purple colour, with dark headers worked in as indicated; all brickwork unpointed. The gables to the garden will be tile-hung. A small loggia gives interest to the garden front, the beam and brackets being oak.

preparation of the plans, which they had not authorised, and for which, it was contended, they were not liable. Mr. Horace Avory, K.C., who appeared for plaintiff, submitted that if there was no sealed contract there was an employment of the plaintiff as an officer of the Council, and he was entitled to the £800 he claimed as remuneration for his services. Mr. Macmorran, K.C., who represented the defendant council, said the plaintiff had been paid his fees with regard to an £80,900 scheme, and the rest of the work done was in respect of the modified scheme of £35,000. As that was not under seal, the plaintiff was in the unfortunate position of being unable to obtain his fees from the defendants.—Mr. Justice Lawrence, in giving judgment, said the whole question was whether the sum of £800 claimed was due under a contract not under seal of the Acton Urban District Council, and the question was whether this was a new employment on a new

and fronting an avenue which ran the whole length of the Exhibition. The Agents-General of the Australian Colonies had taken the piece of ground on which it was built early in 1907, after prolonged negotiations, which were conducted on the faith of a plan which showed an open space or isolated plot in front, planted with trees. The Australian Colonies had agreed to pay a very high rental, in view of the advantages of the site, and had spent more than £100,000 on the pavilion. They were, therefore, very seriously affected by the erection which was being put up. It was understood that this erection had been let to a well-known journal, and it completely effaced the plaintiff's pavilion from the length of the avenue. Mr. Broxholm, for the defendants, said that the plaintiffs had received a plan showing the proposed erection last October before they signed their agreement. He referred to the affidavits of the parties. Mr. Justice Joyce said that he could not

it was alleged, such severe injuries to his spine that he was incapacitated from July 22nd, 1907, until January 22nd of the present year. It was stated that Day provided the scaffolding for the job. James admitted in cross-examination that he walked some miles over the hills on the evening following the accident. His Honour pointed out the inconsistency of the witness's evidence; although he had declared that he was in bed for eight weeks from July 22nd, he was unable to swear that he was not out of doors during Bank Holiday week. For the defence, it was contended that James had been told not to use the trestle, and that he had fallen only a distance of 2ft. 9ins., alighting on his feet. Although the accident happened in July, formal notice of it, as required by the Act, was not given until November.—The judge thought that the evidence given by the applicant was in some respects unsatisfactory. He therefore dismissed the application.

Obituary.

M. JULIEN GUADET, who died last week, at the age of 74, was Inspector-General of Civil Buildings, and professor at the Ecole des Beaux-Arts. He gained as long ago as 1850 the second Prix de Rome for a design for an imperial residence, and for his designs for a hospice in the high Alps he was awarded the architectural gold medal of the Salon. He designed the Girondin monument at Bordeaux; and among his more recent efforts are the new Hôtel des Postes, Paris, and designs for rebuilding the Theatre Francais.

THE LATE MR. J. J. STEVENSON. — In the notice of the death of Mr. J. J. Stevenson, F.S.A., F.R.I.B.A., in our issue for May 13th, there are one or two inaccuracies. Mr. Stevenson, it is true, designed the Red House on Bayswater Hill, for his own occupation, but the architect of the Yellow House was Mr. Ernest George. Mr. Stevenson's work at Cambridge included the new buildings at Christ's College (not Christ Church) and the University Laboratory; but the Sedgwick Geological Museum was designed by Mr. T. G. Jackson.

MR. R. CLIFTON DAVY, architect, of Maidenhead, died recently, aged 57. He was professionally associated with the rise of Maidenhead in the early 'seventies, and carried out many buildings in the town. His chief successes, however, were achieved in domestic work, examples of which are to be found especially on the banks of the Thames from Staines to Pangbourne. On the Bath Road, the High Town Estate, at Boyn Hill, and on the Thicket, are other specimens of his work. He was also the architect of Bray Lodge, Berkshire (formerly the home of Mrs. Brown-Potter). At the time of his death Mr. Davy had in business with him his only son, Mr. Clifton Robert Davy, in whose name the practice will be carried on in future.

MR. J. FULLEYLOVE, vice-president of the Royal Institute of Painters in Water Colours, died somewhat suddenly on Friday last, at his residence in Hampstead. Mr. Fulleylove, who was born in 1847, was, as a youth, articled to Flint and Shenton, a Leicester firm of architects, but abandoned the profession to take up painting, and his works have for many years been a feature of the exhibitions at the Institute's galleries in Piccadilly, and elsewhere. His beautiful drawings are a delightful memory. He devoted himself especially to the painting of gardens with noble architecture, as at Versailles, Hampton Court, Florence, Rome, and Athens, among his publications being "Oxford," "Pictures and Studies of Greek Landscape and Architecture," "Stones of Paris," "The Holy Land," and "Westminster Abbey."

Our Plate.

Pediment from the Galerie des Cerfs, Fontainebleau.

The well-known *Galerie des Cerfs* at Fontainebleau is situated on the ground floor of the palace and has a central doorway opening upon the beautiful grounds known as *Le Jardin de Diane*. The first floor of the pavilion, which forms the west enclosure of the *Cour des Princes*, contains the *Galerie de Diane*, an immense apartment, about 264ft. in length, constructed under Henry IV., and restored by Napoleon I. and Louis XVIII., which is adorned with paintings representing mythological subjects by Blondel and Pujol. Externally the garden facade presents a very good example of the early Renaissance work in France, and its brick walls, enriched with niches containing statues and busts, its high pitched roof, and its quaint pediments, of which the central one is embellished with the King's emblem, an "H" surmounted by a crown, are all typical of this interesting period of art.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
May 30	SCHOOL AT ECCLES to accommodate 800 scholars. Limited to architects in Manchester, Salford, and Eccles district. Premiums £30, £20, and £10. Particulars from the Secretary, Education Committee, Town Hall, Eccles, Lancs.
May 31	EMERGENCY HOSPITAL AT ILFORD. —Premiums £150. Particulars from B. Henderson, 24, Mansfield Road, Ilford, Essex. Deposit £1. Summary in BUILDERS' JOURNAL, January 15th.
June 1	DESIGNS FOR HOUSES to cost £300 and £550 at Cottage Exhibition, Ainsdale, Southport. Prizes of £10 and £5. Particulars from Seaside Garden Village Co., 120, Lord Street, Southport. Particulars in BUILDERS' JOURNAL, February 26th.
June 6	SECONDARY DAY SCHOOL, SHREWSBURY (70 Boys and 70 Girls). —Conditions from W. H. Pendlebury, Secretary, Higher Education Committee, Shire Hall, Shrewsbury.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Particulars in BUILDERS' JOURNAL, April 29th. Conditions from the Secrétariat de l'Association du Monument de la Réformation, 56, Rue du Stand, Geneva.
1909. Jan. 1	WORLD-MEMORIAL TO SHAKESPEARE (proposed to be erected in Park Crescent, Portland Place, London). Sketch designs by this date; final competition to be limited to six competitors.
No date.	COUNCIL SCHOOLS AT NANTWICH. —Particulars from C. E. Speakman, Clerk, Education Offices, Crewe.
No date.	PARISH CHURCH AT BISHOPSWEARMOUTH.—Limited to Sunderland architects. Conditions from H. E. Hinckley, 68, Cleveland Road, Sunderland. Deposit one guinea.
No date.	EXTENSIONS TO WORKHOUSE BUILDINGS, DUDLEY.—Limited to architects practising within 35 miles of Dudley. Conditions from G. W. Coster, Clerk, Union Offices, St. James's Road, Dudley.
June 1	LIBRARIES AT ROWLEY REGIS (Mr. Henry T. Hare, F.R.I.B.A., Assessor.)—Conditions from D. Wright. Clerk, Council Offices, Oldhill, Staffs. Deposit £1.

REVOLVING DOORS.

In view of the announcement made last week that M. Lépine, chief of the Paris police, had forbidden the use of revolving doors in restaurants, hotels, concert halls, and other buildings in the French capital, we are desired to state that the particular objection as regards the blocking of exits is removed by the introduction of a revolving door which is capable of collapsing automatically in case of panic. This fact is pointed out to us by Mr. Muggeridge, the managing director of the Van Kannel Revolving Door Co. The new type of collapsible revolving door has been installed (with the sanction of the London County Council) in many important buildings in different parts of the metropolis, amongst which are the hotels Ritz, Waldorf, Russell, Great Central, Lyons' Popular Café, the Criterion Restaurant, Madame Tussaud's, etc., and doors of this character have also been installed in certain buildings in the provinces, including the Blackpool Tower, and the Midland Theatre at Manchester. It has been suggested to the French company making revolving doors that they also should adopt the panic collapsible type, and no doubt they will do so, with the consequence that the Paris police will withdraw their objection. The Van Kannel Revolving Door Co. state that they are making some important improvements at the present time on the collapsible revolving door, and they feel sure that when these are embodied in their existing patents no objection can possibly be raised against the use of the revolving door, both as a means of absolutely preventing draughts, and as a safety emergency exit.

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
The querist's name and address must always be given, not necessarily for publication.

Covering Over a Watercourse.

LONDON, W.C. — A. G. writes: "A watercourse which runs through a garden is to be covered over with concrete. Please state what thickness of concrete would be necessary for the top, and what size T-iron bars, and how far apart they should be, having regard to the wire netting. No weight is to be carried, beyond about 2ft. of soil on the top, to form a garden path."

We suggest omitting the wire netting altogether, and we advise the use of round steel rods instead of the T-iron. The top should be 5ins. thick, made of concrete composed of 1 part best finely-ground Portland cement, two parts clean sharp sand, and four parts clean ballast, broken to pass a $\frac{3}{4}$-in. mesh sieve, reinforced with $\frac{7}{16}$ in. diam. round steel bars spaced at 6in. centres lying $\frac{3}{4}$-in. above the underside of the concrete.

Books on Heating and Ventilation.

CORK.—Z.Y.X. writes: "Please give author, title, price, and publisher of suitable books to form a course of study of heating and ventilation."

Up-to-date books on these subjects are: "Heating by Hot Water, Ventilation, and Hot-water Supply," by Walter Jones (6s. net; Crosby, Lockwood and Son); "Ventilation, Heating, and Lighting," by W. H. Maxwell (3s. net; Sanitary Publishing Company); "Ventilation, Heating, and Lighting of Dwellings," by J. W. Thomas (6s.; Longmans, Green and Co.): and "Plenum or Propulsion System of Heating and Ventilation," by Harold Griffiths (4s. 6d. net; Simpkin, Marshall and Co.). It is not suggested that all these books should be obtained. Probably one or two would be sufficient.

The Next Building Trades Exhibition.

MANCHESTER.—D. writes: "When and where will the next International Building Trades Exhibition be held?"

At Olympia, from April 17th to May 1st, next year.

Book-Keeping for Builders.

LONDON.—TUFNELL writes: "Is there published a text-book on bookkeeping with special reference to the building trade?"

Some years ago a book on the subject was published by Mr. Sidney Saker, of 95-97, Finsbury Pavement, E.C., price 3s. 6d. There is also a small book entitled "Bookkeeping for Builders, specially adapted for small businesses," by Mr. Arthur E. Davies, chartered accountant, of 18, Ironmonger Lane, Cheapside,

E.C., price 1s.: while another book is "Builders' Accounts," by Mr. John A. Walbank, A.C.A., this being vol. 3 of "The Accountants' Library," published by Messrs. Gee and Co., of 62, Moorgate Street, E.C., price 3s. 6d. net.

Small Houses.

G. writes: "Can you give me particulars of any books published of residences costing about £600 to build?"

You will probably find what you want in "Cottages and Week-end Homes," by Mr. J. H. Elder-Duncan, published by Messrs. Cassell and Co., price 5s. net. For a book of a similar character dealing with furnishing, we would refer you to "The House Beautiful and Useful," by the same author, price 5s. net.

The Builders' Foremen's Association.

LEEDS.—A.T. writes: "What is the address of the secretary of the Builders' Foremen's Association?"

The Association formerly held its meetings at Memorial Hall, Farringdon Street, but now holds them at the premises of the Sunday School Union, 56, Old Bailey, London, E.C., to which address it would no doubt be safe to forward any communications for the secretary (we are unable to find any indication of the Association's existence in the Post Office Directory or the usual sources of information).

London Offices of Canadian and Pacific Railway Companies.

NEWCASTLE.—C.E.P. writes: "I shall be glad to know the London addresses of the Grand Trunk (Canada) Railway Co. and the Grand Trunk Pacific Railway Co."

The address of the former is 9, New Broad Street, E.C. As regards the latter, we cannot trace any company having that title, though there is the Grand Trunk Railway system, with offices at 44 to 46, Leadenhall Street, E.C.

Enamel for Bath.

CROYDON.—F.E.S. writes: "Where can I obtain an enamel called 'Chez-Lui'? I want it for doing up a bath."

The enamel you require is supplied by Messrs. James Price and Son, of 10-20, Fitzroy Place, Euston Road, London, N.W.

Books for Examinations.

NORTHAMPTON.—G.R. writes: "Kindly suggest the best books to study for the R.I.B.A. Intermediate Examination."

See back issues of our Journal, where this information has been given several times. The list of books recommended by the Institute is now under revision by a committee of the Board of Examiners, and will be published as soon as possible.

DOUGLAS.—A.K. writes: "What are the necessary books for the Royal Sanitary Institute Examination relating to buildings and public works?"

Apply to the secretary of the Institute, Parkes Museum, Margaret Street, W.

Downdraught in Chimneys.

GLASGOW.—ANXIOUS writes: "Can you suggest any cause for downdraught in the chimneys shown in the accompanying sketches?" (Sketch not reproduced.)

No reason for the downdraughts on these chimneys is apparent, so far as their arrangement and construction are concerned; although it is quite possible that the chimney stacks would have been better if they had been a little higher. Are there any tall trees or buildings adjacent? My experience has been that in the vast majority of cases the "smoky chimney" is caused—(1) by the malformation of the opening at the breast (it is often much too large), or (2) by the kind of fire-grate adopted being one in which the draught necessary to carry the smoke away is created only with difficulty. The querist is strongly advised to look for the cause of this downdraught at the foot and not at the top of the flues.

French and Belgian Building Papers.

GLOUCESTER.—H.E.T. writes: "Can you give the titles and publishers of a few of the most important French and Belgian building papers?"

If you will refer to p. 122 of our issue for March 13th, 1907, you will there find a list of all the foreign architectural and building papers, together with the subscription price of each. Two good French journals are "La Construction Moderne," 13, Rue Bonaparte, Paris (weekly), and "L'Architecture," 51, Rue des Ecoles, Paris (also weekly).

Buildings to Measure at Bath.

TEDDINGTON.—SUBSCRIBER writes: "I propose to spend a week or a fortnight in Bath. Could you give me a list of churches and other buildings of interest in and around Bath that I might sketch?"

See p. 311, July 8th, 1903.

ARMOURED FIRE DOORS.

In view of the interest which is being taken in the question of fire doors, both by the building authorities and by the insurance companies, we give on this page a view of an armoured door which successfully withstood a fire at Bristol at the premises of Messrs. Bodey, Jerim and Denning, Ltd., who state that practically one-half of their property was saved through the instrumentality of the doors of this class which were fitted in the building. The door shown is of the type known as the "Dowson-Taylor," manufactured by Messrs. Mather and Platt, Ltd.

Another instance where armoured doors proved their efficiency was afforded by the fire at the Royal Mills, Esher, in January last, while a still more recent example is the Drury Lane Theatre fire, where some of the armoured doors, though 25 ft. high and 6 ft. 6 ins. wide, successfully withstood the heat to which they were subjected.

Messrs. Mather and Platt, Ltd., specialise in this type of door, and have effected many improvements in the fittings to ensure that the doors, whilst being easily opened and shut, are, when closed, held tightly to the opening. The doors are made by them to the specifications of the Fire Offices Committee and to fulfil the requirements of the London County Council.

ARMOURED DOOR WHICH WITHSTOOD FIRE AT THE PREMISES OF BODEY, JERIM AND DENNING, LTD., AT BRISTOL.

CONTRACTORS' SECTION
(MONTHLY.)

View taken on January 17th, 1908.

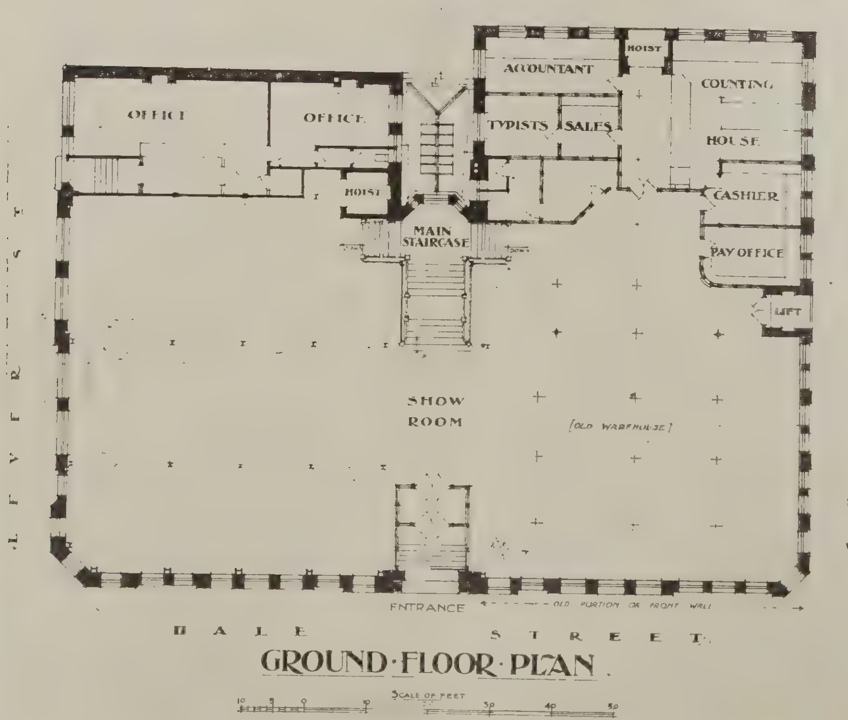
AN EXAMPLE OF RAPID CONSTRUCTION.

We publish herewith a series of photographs illustrating the rapid erection of a new warehouse for Messrs. Hall, Higham and Co. at the corner of Dale Street and Lever Street, Manchester. This firm has been established for many years in the old warehouse which forms the right-hand half of the block as seen in the photograph. The new half had to match the existing half on the Dale Street front, which necessitated the use of certain old-fashioned features of window design. In the old portion the basement and ground-floor front walls were cut out and a Portland stone facade introduced. In the old portion also the fourth or top floor was completely taken off, and new fourth, fifth and sixth floors added. It will be noticed also from the photograph taken in September that a complete vertical slice was taken out of the old frontage where the new doorway and central feature is inserted. The old brick front was treated by the Farman sand-blast process, and thus a new appearance was given to the work. All these alterations to the old building were carried out without business being stopped in the warehouse. The remainder of the work was straightforward.

The photographs show that the whole undertaking was carried out in five months.

The fifth floor of the warehouse is especially well lighted for the purpose of millinery business. On the sixth floor are placed the kitchens and staff dining-rooms, etc.

With regard to the materials, the elevations are of Portland stone and brick; floors are by the Fram Fireproof Construction Co.; stallboard lights are by Messrs. Hayward Bros. and Eckstein, for one portion, and by the Improved Pave-



Main Entrance.

NEW PREMISES FOR HALL, HIGHAM AND CO. AT THE CORNER OF DALE STREET AND LEVER STREET, MANCHESTER.
CHARLES HEATHCOTE AND SONS, ARCHITECTS.

August 17th, 1907.

September 17th, 1907.

ment Light Co. for the other. Mr. Reuben Bennett made the lead lights to the staircase area. Some good carving was done by Messrs. Earp, Hobbs and Miller, of Manchester—in particular the figures over the front entrance, which represent the staple trade of Lancashire. The lifts are by Messrs. Sprowson, and the metalwork by Messrs. Humphries, Jackson and Ambler, Ltd.

The entrance doors are the new patent "Sesame" doors which open automatically as soon as the adjoining mats on either side are trodden upon; they were supplied by Messrs. Pemberton, Arber and Co., of Gray's Inn Passage, London.

The general contractors for the building were Messrs. Robert Neill and Sons, of Manchester, and the architects Messrs. Charles Heathcote and Sons, of Cross Street, Manchester, and Cannon Street, London.

THE BUILDING TRADE NORTHERN CONCILIATION BOARD have awarded the joiners of St. Helens an increase of ¼d. an hour.

CHANGE OF TITLE.—The London Electrical Fittings Co., Ltd., has changed its title to "Galsworthy, Ltd." (Mr. Montague H. Galsworthy, A.M.I.E.E., and Mr. Sydney S. Galsworthy, A.M.I.E.E., managing directors). The reason for this alteration is that the firm has decided to take up the manufacture of high-class gas fittings in addition to electric-light fittings. The show-rooms will still be at 15 and 16, Newman Street, Oxford Street, W., where a room devoted to gas fittings has now been added.

October 17th, 1907.

November 17th, 1907.

NEW PREMISES FOR HALL, HIGHAM AND CO., MANCHESTER: VIEWS SHOWING PROGRESS OF WORK.

THE NORTHERN & SOUTHERN METHODS OF SCAFFOLDING.

By A. G. H. Thatcher.

(Concluded from p. 386, No. 690.)

Before proceeding to refer to details of what may be called the minor methods of scaffolding, it may be as well to sum up the advantages and disadvantages of the scaffolding already referred to.

Comparing the overhand or inside methods with the external or pole scaffolds, it may be claimed for the former that, being fixed on the floors and having less height, a greater rigidity can be gained. The absence of poles in several instances given allows of a greater freedom when handling and moving material. The standards, not being to the same extent of whole timbers, but built up, a defect in a scantling would not be so likely to have a serious result; while in the case of falls, if the surrounding floors are planked over, the danger to life is not so great.

With regard to pole scaffolds, they can be left in place for the final cleaning down, thus not necessitating the use of extra scaffolding for that purpose. The first platform and succeeding ones are adjustable to any height required, the ledgers being placed where required, and not upon pre-arranged bolt holes. The uprights can be fixed at any distance apart (the ledgers, being continuous, permit this), while the sawn timbers are of standardised length.

With the bricklayers' pole scaffold an injurious effect is caused by the action of weighted putlogs resting in the green brickwork. Although this may not be so apparent if the load is light, still, in works of any size, there is a tendency to store bricks near where the bricklayers are working, and from this the ill-effect may arise.

Bracket Scaffolds.

The Scottish use of wall brackets is one unknown in the south, and perhaps the loss is no great one. The brackets (Fig. 10) are of wood, and are supported by means of a spike driven into the wall in the position shown in the diagram. The walls, being of stone, have considerable holding power, so that the brackets are considered safe when fixed at any height from the ground. The spike (Fig. 11) is driven into the joints of the stone, and the safety of the whole arrangement depends upon its security. Great care is taken to gain this end, the work not being entrusted to a labourer, but carried out by a mason. A hole is cut into the joint with a hammer and chisel of sufficient size to catch the thin end of the spike, which is then driven in to a distance of 5 or 6 ins., the mason satisfying himself afterwards that it has taken a good and sufficient grip. To firmly hold and prevent rocking a wooden wedge is driven in between the bracket and the wall. It is considered that the weight of a ton could be supported on each pin, although a considerable factor of safety is taken in actual practice. The brackets, which are fixed about 10ft. apart, carry a platform two boards wide. This is a form of scaffolding chiefly adopted for repairs. The fixing is usually performed from a ladder or a convenient window, the work being commenced at the top of the building, and carried downwards.

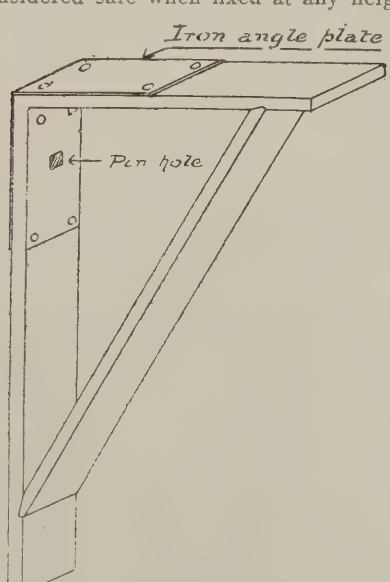
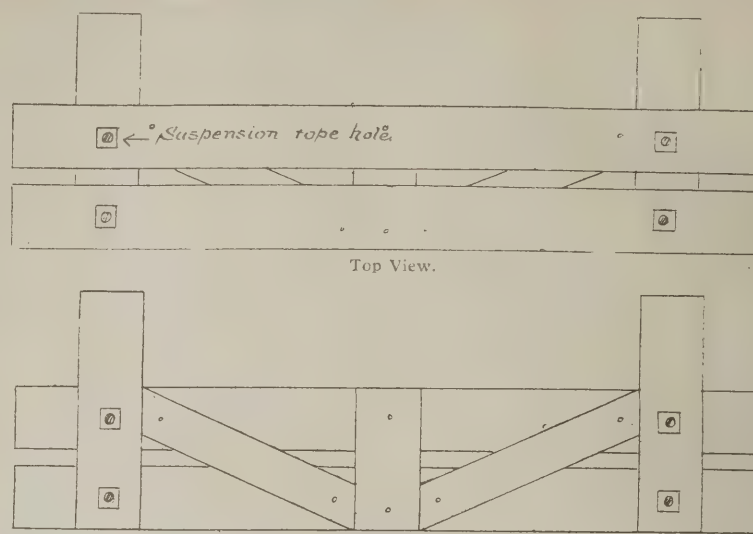


FIG. 10. WALL BRACKET.

FIG. 11. SPIKE FOR USE WITH WALL BRACKET.



Top View.

Bottom View.

FIG. 12. SCOTTISH BOAT.

Bracket scaffolds are sometimes used for new buildings, the work being carried up roughly by the ordinary means, and the brackets used for pointing down. Although this is still a common type of scaffold, it is not now so frequently seen as in the past. No particular danger of collapse is necessarily to be apprehended, but it is a good rule for the spikes not to be fixed within 5ft. of the eaves. Any less distance than this may cause the joints to be sprung, owing to the lack of weight above. No great weight of material is carried, the most being a pail of cement.

A similar type of scaffolding is used by slaters. In this case they are fixed at the eaves. The scaffolding is of the same shape, but the top portion is lengthened to run over the eaves, and then spiked down to a spar, two or three slates being left out for their reception. The alternative to this is to run out a needle scaffolding at the eaves level, and to lay out platforms from which the work proceeds by means of an ordinary figure or roof bracket.

The work of pointing, for which the first of these brackets is used, is generally carried on in the south by means of the ordinary pole scaffold, which, after the erection is finished, is left up for this to be done, being struck as the work is finally completed. With the Scottish overhand method of building, this of course is impossible, but an improvement (certainly safer and less destructive) would be to use

the Boat or Cradle.

The boat is not altogether unknown in the north, but has not reached the state of perfection seen in the south, where it is often known as the cradle.

The principle of its construction is an open one, that is to say, the platform boards are not closed in on all four sides, as with the cradle, Fig. 12 shows the construction. The men sit to their work, their utmost protection being a guard rope, which is tied from one supporting rope to the other. The boat, or bo'sun's seat, as it is known, where the accommodation is only for one man, has gone out of use in London, its replacement by the cradle (Fig. 13) being one of the improvements of recent years. The Scottish method of fastening the suspension rope is to carry it through the roof and fasten off to a spar. This overhangs the eaves and carries an eye to which is attached a block carrying the tackle. The other

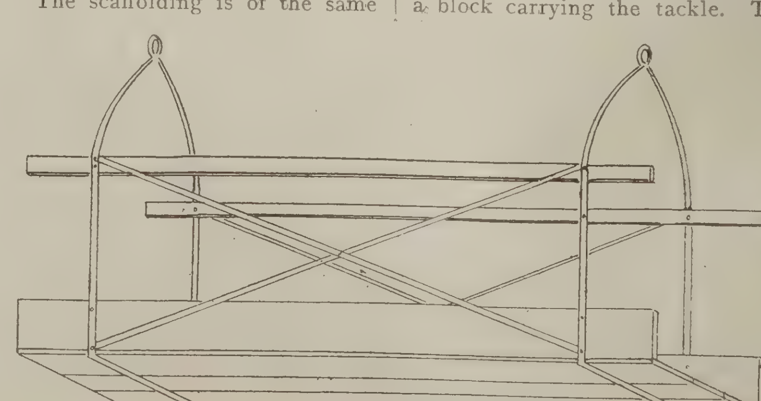


FIG. 13. CRADLE.

end of the tackle is fastened to the scaffold by means of rope slings, or wire slings are bolted through the scaffolding. In the south, however, much ingenuity is shown by the use of jibs and counterbalancing weights (Fig. 14), to do away with any

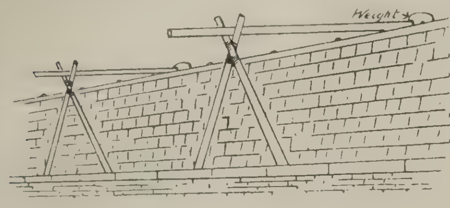


FIG. 14. JIBS FOR SLINGING CRADLES.

interference with the roof material. The width of platform, with the cradle, is usually three boards, but the boat or bo'sun's seat is generally two boards only, each $10\frac{1}{2}$ ins., with a 2 or 3 in. space between, through which the suspension rope runs. The boards are joined together on the underside by cross and angle pieces, and the bolt holes for rope connections should be protected by iron plates.

Roof Brackets.

There is a great similarity between the roof scaffolds used both in the north and south, but some differences exist in the details, and in the methods of fixing. Fig. 15 illustrates a slater's truss of ordinary

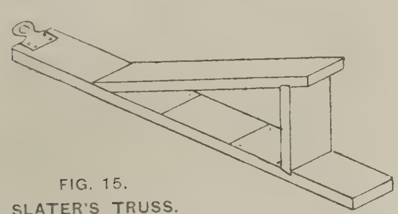


FIG. 15.
SLATER'S TRUSS.

type. An objection to it is that it is not adjustable to the pitch of the roof, although there are now patented appliances on the market which provide for this. The northern truss is smaller, and often carries one board only as a platform instead of two as in the south.

Another method of carrying the platform is now obtaining a vogue in Scotland. The timber truss is superseded by an iron dog similar in shape to the truss, and is driven into the roof to carry the boards. It has a very slight grip of the timbers, and this creates a danger, for, when the platform is loaded, the boards sag and cause the dogs to twist and work loose. The only advantage gained is portability. On steep pitches, such as church roofs, it is not considered safe. The platform boards vary from 9in. by $1\frac{1}{2}$in., being about 2ins. less in width.

The method of fixing the timber truss in the south is by rope suspension, the end of the rope being tied to the ridge or carried over and fixed to a suitable place, or even to a balancing weight. This latter is not recommended, as the varying weights on the platform prevent equal balancing, with the result that a slip may occur.

The ridge is also used in the north.

Another method in use there is to screw a large bolt with an eye-head into the timber, and fasten off the rope to that.

With these scaffolds it is wise to leave a platform at the eaves (if a pole scaffold is erected), as a safeguard in case of falls.

The danger with the overhand method —that is, with no outside scaffolding—is obviated by the use of the bracket scaffolds previously described, or by the use of needles carried out about 3ft. at the level of the eaves, and supporting a platform. This arrangement is also useful to commence the work from. Taking all things into consideration, there can be no doubt that the southern system is the better.

Carpenters' Scaffolding.

Scaffolding for carpenters when erecting timber roofs is practically the same everywhere. As much use as possible is made of the tie and collar beams, to support planks and supplement the scaffolding, and the work is done from these. The initial difficulty is the fixing of the two first principals.

Block Scaffolding.

Block scaffolding—that is, platforms supported on drain-pipes and similar material—is not generally known in the north, and need only be mentioned to be condemned. It is a method that admits of no bracing, and is entirely insecure.

Varieties of Scaffolding Adopted in the Provinces.

Apart from the methods described, certain variations occur in different localities. A brief survey will be made of these.

In Yorkshire many differences occur, even as between town and town. The scaffolding as a whole is not so strongly built as in London, the standards often being 12ft. to 13ft. apart—taking Leeds for an example. Poles are generally used, but scantlings are not uncommon. Platform boards vary in places from 8ins. by 3ins. to 7ins. by $2\frac{1}{2}$ins., and in the smaller towns are laid four boards wide only. Putlogs are placed 6ft. apart, and three are used per board. The putlogs are $4\frac{1}{2}$ins. by 3ins., and are out of the best red wood, without knots—not birch, as in London.

In the Wigan district of Lancashire framed scaffolds are greatly in use. They are built up with 7in. by 3in. battens, which form both standards and putlogs, and boards of the same scantling are used. Bracing is done from the wall. A piece of timber about 3ins. by $1\frac{1}{2}$ins. is nailed to the putlog at the wall end, and to the foot of the standard. If the floor joists are in, it may be nailed to the joists instead of the standard. The bracing longitudinally is from the top of one standard to the foot of the next, forming a cross. Six 7in. planks are used for the platforms. The buildings, not being of great height, allow of trestles to be used for the second platform.

Pole scaffolds are used for buildings with heavy cornice projections—that is to say, poles are used for standards, and sometimes for ledgers; but these latter are often 7in. by 3in. battens lashed to the poles.

In Newcastle and district the London system is prevalent, both for stone and for brick buildings. Trestles are used for inside work on the floors; and where such do not exist, as in the case of church building, poles are erected, both inside and outside, especially if the work is of brick with a stone facing.

In Manchester both the northern and southern systems are to be seen, but the overhand is perhaps the more common. The platform boards are stouter, 7ins. by 3ins. being used, and they are laid in a somewhat different way from that in ordinary use. Fig. 16 represents the usual method of laying lapped boards, and Fig. 17 the Manchester style. Interior pole scaffolding in small buildings also varies, the method being to fix the putlogs on the wall and the other end upon an upright stayed from the floor joists or other portion of the floor, with the planks laid across. No ledgers are used, the standards being connected by bracing.

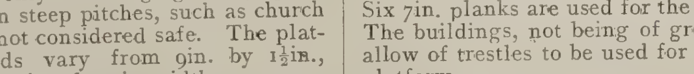


FIG 16. USUAL METHOD OF LAPPING BOARDS.

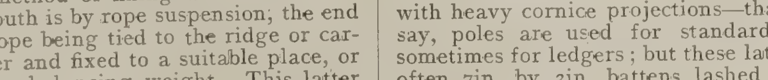


FIG. 17. MANCHESTER STYLE OF LAPPING BOARDS.

THE PORTLAND CEMENT TRADE.

The slight improvement which was noticed in March, and which was interrupted by the Easter holidays and the inclement weather of April, has shown itself again, although it is doubtful whether the demand has yet reached normal figures for this time of the year. There is undoubtedly a more hopeful feeling prevalent amongst manufacturers as to the course of business at an early date, having regard to the numerous heavy constructional works which are on the point of making a start in various parts of the country, and also abroad; while the pronounced ease in the money market is bound to have a beneficial effect in all directions.

The adjudication of the Panama Canal tenders takes place on June 1st, but, as has been previously stated, it is not anticipated that any share of this business will come to Europe. This huge undertaking, however, will draw enormous quantities of cement from about the end of this year, and this will tend to keep the American manufacturer busy. On the Continent, too, the enlargement of the Antwerp Docks and the extensions of the Kiel Canal will require very large quantites of cement, the whole of which will be supplied from manufacturers in Germany and Belgium, and as the building trades in those countries still continue brisk, there is no doubt that cement manufacturers there can confidently look forward to busy times in the near future.

We understand that the Admiralty specifications are in the hands of contractors who are tendering for the new lock at Portsmouth, which work will be commenced without loss of time, and it is pretty generally understood that the Government intend to push forward with the utmost speed the preliminaries in connection with the large new works at Rosyth.

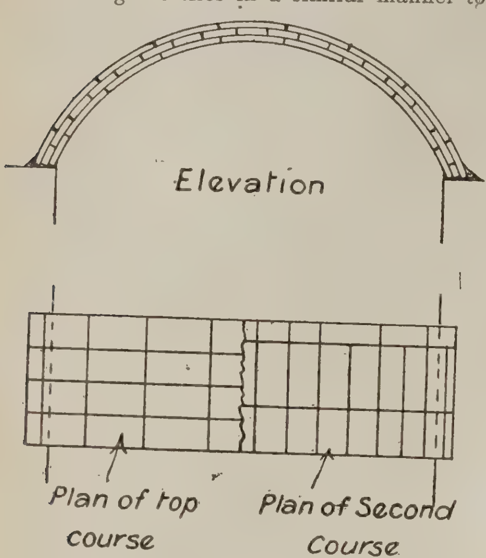
Another work of considerable interest to the cement trade is the large extension which has just been sanctioned by the Mersey Docks and Harbour Board. This work will involve about $3\frac{1}{2}$ millions of money; it will probably be carried out by the Harbour Board itself, and will be taken in hand without loss of time.

The general building trades show but little activity, but here, again, cheap money is bound in time to infuse more life.

A NEW SET OF BY-LAWS, dealing especially with new streets and buildings, has been adopted by the Town Council of Hornsey, and the Local Government Board has been asked to confirm them. Hornsey has increased so rapidly within the past few years that the old by-laws were found quite out of date in dealing with the new roads and new buildings within the borough.

A NEW METHOD OF BUILDING WITH TILES.

An interesting exhibit at the recent Municipal, Building and Public Health Exhibition at the Agricultural Hall, Islington, not classified in the programme, was a new development in the use of tiles by Messrs. Miro Trepat and Co., of Barcelona. This consisted of bonding the tiles in a similar manner to



brickwork, and setting them in a quick-setting cement. Arches, domes, soffits to stairs and similar constructions can be rapidly built with them by one bricklayer, without centering or supports of any kind. The bricklayer places a trowelful of cement on the brickwork and presses the end of a tile into it; it sets in a few minutes. A second tile is then placed at the side of it in a similar manner. Then a third tile, floated with the quick-setting cement, is placed upon them. This process is continued until the whole arch is completed. An arch of three layers of tiles sustained the weight of a man. The accompanying sketch shows the method of constructing an arch.

THE RANSOME CONCRETE MIXER.

With the increasing use of concrete for building and engineering purposes, especially in connection with reinforced concrete work, it is becoming generally recognised that hand-mixing is a slow and unsatisfactory process. Hence the concrete-mixing machine is coming more and more into vogue. There are several types of such machines, and of these the mixer made by Messrs. Ransomes and Rapier, Ltd., of Ipswich, is a very efficient one, giving a continuous and rapid supply of thoroughly mixed concrete of uniform quality. This mixer has many features to commend it. As will be seen from the accompanying illustration, it is extremely compact, simple in construction, with nothing to get out of order in the ordinary course of work. The drum is built up of steel plate, and is mounted on four rollers (not on an axle or on trunnions), being rotated by spur gearing. The aggregate and water are fed in through a hopper at the back, so arranged that the machine need not be stopped while a fresh batch is being introduced into the drum, and, similarly, the mixed concrete can be delivered down the chute at the front while the drum continues to revolve. Thus the mixing can be carried on continuously, and without any tilting of the machine, for it is only necessary to turn the chute down when a batch has been mixed and is ready, and to turn up the chute again for the mixing of a fresh batch; moreover, by the simple operation of a lever, the delivery of the concrete can be regulated, instead of being thrown out in an unmanageable mass. The actual mixing is performed by two sets of steel scoops within the drum, which also is self-cleansing, as a few shovelsful of stone and gravel, with a little water, will thoroughly scour the drum after a few turns, leaving the interior quite clean. The machine is supplied for belt-drive, motor-drive, or coupled up direct with engine and boiler, full particulars of each of which types can be obtained from the Ransome-verMehr Machinery Co., at Caxton House, Westminster.

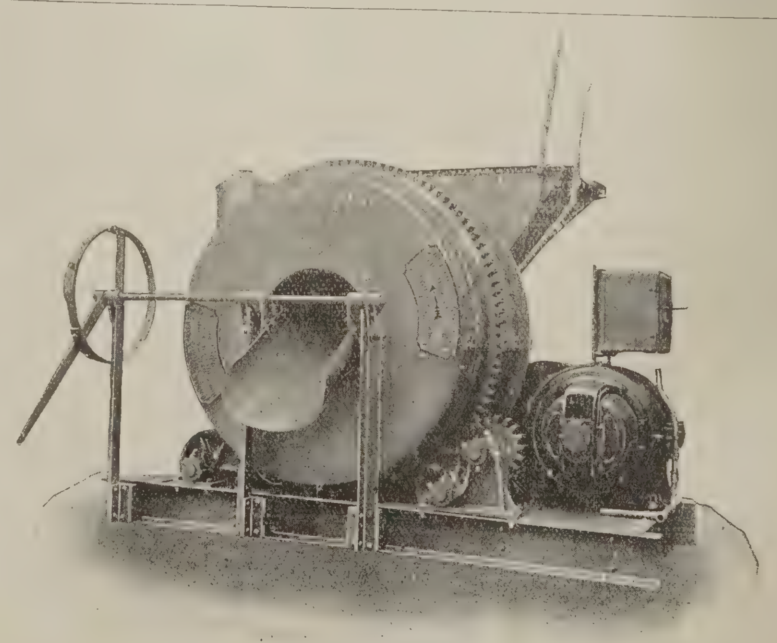
A JOINTLESS FLOORING MATERIAL.

For buildings of all classes, and particularly for buildings of a public character, the value of an impervious and jointless flooring material is becoming universally recognised. Joints of any kind ultimately mean the harbouring of more or less dust and dirt. In hospitals this is especially so. The difficulty has hitherto been, however, to secure a flooring which possesses these advantages when first laid and retains them after constant use. Terrazzo has been a favourite, and while there can be no doubt as to its wearing qualities and the possibility of keeping it in a thoroughly clean and sanitary condition, it is nevertheless liable to crack, by reason of unequal settlement, or defective foundation, and it also has the disadvantages of being cold, cheerless and noisy, which qualities preclude its use in many cases, however adaptable it may be for others. For example, in the operating theatre of a hospital a terrazzo floor is eminently suitable, as the conditions are simply those of cleanliness, not of comfort or quietness; whereas such a floor would be quite unsuitable for hospital wards, where, in addition to cleanliness, the requirements demand as little noise as possible and a distinctly cheerful appearance. It is obvious that the ideal floor is one which is laid in situ in a plastic form, jointless, adaptable to every corner and turn of the apartment or space being dealt with, of good wearing quality, quiet to walk upon, of pleasant appearance and colour, and free from the risk of cracking. Such a material is "Doloment." This is a patent flooring which has been introduced into this country by the British Doloment Co., Ltd., of Caxton House, Westminster, and though it has been before the public here for a comparatively short period only, it has already been extensively employed, not only by leading architects and engineers (including Sir Aston Webb, Mr. W. E. Riley, Mr. Edwin T. Hall, Mr. Marshall Mackenzie, Mr. Arthur T. Bolton, etc.), but also by H.M. Office of Works, War Office, Admiralty, and other Government departments—which is eloquent testimony to its value.

The outstanding feature of "Doloment" flooring is that it consists of two distinct layers, the lower one of which takes up all inequalities or settlement of the foundation, while the top layer forms the elastic surface of the floor, jointless, non-absorbent, odourless, and non-flammable. Another great advantage is that it can be turned up for walls, so as to form a skirting which is very desirable in hospitals and other buildings. The total thickness of "Doloment" is ⅞ in. It can be obtained in several colours—red and yellow being the most generally used, the former having a particularly warm appearance. It is suitable for all classes of buildings—schools, libraries, factories, offices, hospitals, and infirmaries, etc.—and can be recommended as a cheap, thoroughly serviceable, and lasting flooring material.

THE "BARROL" VENTILATOR.

We have received from Messrs. David Rowell and Co., of 31, Old Queen Street, Westminster, a copy of their booklet on the "Barrol" patent ventilator. The particular feature of this ventilator is the arrangement of inclined louvre plates behind vertical baffle plates. This arrangement creates a strong up-draught which removes the vitiated air in the building, while at the same time preventing the down-draught that is bound to occur with louvre blades set in the ordinary manner. The "Barrol" ventilator is made in a variety of types and sizes, to suit various classes of buildings, one of these types being a "concealed roof ventilator," which is most useful in certain cases. Inlet brackets, tubes and panels, and soil pipe ventilators are also made by the firm.



THE RANSOME CONCRETE MIXER, WITH MOTOR DRIVE.

Current Market Rates of Materials in the Various Trades.

The quotations given in this list apply only to larger quantities purchased in London (the minimum quantity for which these pricee are applicable being given where practicable). Retail purchasers must expect to pay a reasonable advance on wholesale rates, as well ascarriage. The trade discounts for each item have not been considered, as these would be affected by the quantity of the goods purchased. The market rates one month ago for those materials which are subject to any appreciable fluctuations are also given, for purposes of comparison, and as indicating a rise or fall in prices, and for those which are not subject to these changes an endeavour is made to give fair average prices which would in many cases be affected by the quality of the materials required.

BRICKLAYER.

The current rates for stocks, Flettons, and other common building bricks, and for local facings are not given, as local considerations obviously affect their prices, and readers who may make use of the information given in these columns can readily obtain quotations for themselves.

		Current rates.	Rates for similar materials on May 1.
Best blue pressed Staffordshire bricks	per 1,000	3 5 0	
do. bullnose bricks	do.	3 15 0	
Best Stourbridge fire bricks	do.	4 15 0	

Glazed Bricks.

		Current rates.	Rates for similar materials on May 1.
Best white and ivory white-glazed one side	per 1,000	10 7 6	
do. glazed one end	do.	9 17 6	
do. quoins, bullnose bricks, and bricks glazed on 4½in. side	do.	13 17 6	
do. glazed two sides (double stretchers)	do.	15 17 6	
do. glazed two ends (double headers)	do.	12 17 6	
do. glazed one side and two ends	do.	16 17 6	
do. glazed two sides and one end	do.	17 17 6	
Splays, chamfers, and squints (to an angle of 45 degs.)	do.	15 7 6	
Double bullnose bricks, double splays, round ends, bullnose stops, and mitres	each	0 0 5	
Double bullnosed mitres ...	do.	0 0 7	
Internal angles, 2¼in. radius	do.	0 0 4	
do. do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Best buff and cream	per 1,000	11 17 6	
do. glazed one end	do.	11 7 6	
Other colours, extra ...	do.	4 0 0	
do. quoins, bullnoses, and bricks, glazed on 4½in. sides*	do.	15 17 6	
do. glazed two sides (double stretchers)*	do.	18 17 6	
do. glazed two ends (double headers)*	do.	15 17 6	
do. glazed one side and two ends	do.	19 17 6	
*These bricks in other colours, extra	do.	3 10 0	
do. glazed two sides and one end	do.	20 17 6	
Splays, chamfers, and squints for an angle of 45 degs	do.	19 17 6	
In other colours, extra ...	do.	3 0 0	
Internal angles, 2¼in. radius	each	0 0 5	
do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Ordinary-quality salt-glazed bricks, glazed one side ...	per 1,000	8 17 6	
do. glazed one end	do.	8 7 6	
do. quoins, bullnoses and bricks, glazed on 4½in. sides	do.	12 7 6	
do. glazed two sides (double stretchers)	do.	14 7 6	
do. glazed two ends (double headers)	do.	11 7 6	
do. glazed one side and two ends	do.	15 7 6	
do. glazed two sides and one end	do.	16 7 6	
do. splays, chamfers, and squints for an angle of 45 degs.	do.	13 17 6	
Specially prepared or dipped salt-glazed with plain glazed side or ends, as described above, same price as for best ivory whites	per 1,000		
Ordinary-quality salt-glazed double bullnoses, double splays, round ends, bullnosed stops and mitres	each	0 0 4	
Best dipped salt-glazed do.	do.	0 0 5	
Ordinary salt-glazed double bullnosed mitres	do.	0 0 4	
Best dipped salt-glazed do.	do.	0 0 5	
Ordinary salt-glazed internal angles, 2¼in. radius	do.	0 0 3	
do. 4½in. radius	do.	0 0 5	
Best dipped salt-glazed internal angles, 2¼in. radius	do.	0 0 4	
do. 4½in. radius	do.	0 0 8	
Ordinary salt-glazed moulded bricks (stretchers and headers)	do.	0 0 8	
Best dipped do.	do.	0 0 8	
Second-quality glazed white and ivory white, 30s. per 1,000 less than best white			35s. less.
Second-quality coloured bricks, same price as best whites of their respective descriptions			
Plain arch bricks £6 per 1,000 above list for respective kinds and colours			£4 per 1,000 above list.
Cambered arch bricks 1s. 2d. each, any kind or colour, if not exceeding 9 ins. by 4½ins. by 2 ins			1s. each.
Rich majolica glazed bricks (headers and stretchers)	per 1,000	21 17 6	
do. quoins and bullnoses ...	do.	26 17 6	

Sand, Ballast, Cement, Lime, and Fireclay.

		Current rates.	Rates for similar materials on May 1.
Thames and pit sand ...	per yard	0 7 0	
Thames ballast	do.	0 5 6	
Best Portland cement ...	per cask	0 5 10	
Best ground blue lias lime	per ton	0 19 0	
(NOTE.—The charge for the sacks to be added to prices per ton.)			
Grey stone lime	per yard	0 11 6	
Stourbridge fireclay in sacks	per ton	0 27 6	upwards

MASON, SLATER AND TILER.

The average current prices for stone per foot cube are given in the following list, the railway rates being calculated on the assumption that orders will be given for full truck loads of about 4 tons upwards.

		Current rates.	Rates for similar materials on May 1.
Brown Whitbed Portland stone (in blocks containing on an average 20 ft. cube)	per ft. cube	0 2 0	
White Basebed do.	do.	0 2 1½	
Bath stone	do.	0 1 6	
Beer stone	do.	0 1 6	
Ancaster stone	do.	0 1 10	
Greenshill stone	do.	0 1 10	
Chilmark stone	do.	0 1 9	
Darley Dale stone	do.	0 2 3	upwards
Red Mansfield stone	do.	0 2 4	
Closeburn red freestone ...	do.	0 2 0	
Hard York stone	do.	0 2 10	
do. 6 in. sawn both sides landings (random sizes)	per ft. super	0 2 4	
do. 6 ins. rubbed two sides do.	do.	0 2 7	
do. 3 ins. sawn two sides slabs	do.	0 1 0	
do. 2 ins. self-faced random slabs	do.	0 0 6	
Broken Granite (blue Guernsey), 1½ ins. ...	per ton.	0 9 9	c.i.f. Thames
do. do. 2 ins. ...	do.	0 9 6	do.
do. do. 2½ins ...	do.	0 9 0	do.
do. (Imperial blue Scotch), 1½ ins.	do.	0 8 9	do
do. do. 2 ins. ...	do.	0 8 6	do.
do. do. 2½ ins. ...	do.	0 8 3	do.
do. (Midland Counties), 1½ ins.	do.	0 11 0	London stations
do. do. 2 ins. ...	do.	0 10 9	do.
do. do. 2½ ins. ...	do.	0 10 6	do.
Granite Kerb (Norwegian), 6 ins. by 12 ins. ...	per foot	0 1 4	c.i.f. Thames
do. do. 12 ins. by 6		0 1 4	do.
do. do. 12 ins. by 8		0 1 6	do.
do. (Imperial blue Scotch) 6 ins. by 12 ins.	do.	0 1 3	do.
do. do. 12 ins. by 6		0 1 3	do.
do. do. 12 ins. by 8		0 1 5	do.
do. (grey Jersey), 6 ins. by 12 ins.	do.	0 1 3¾	do.
do. do. 12 ins. by 6		0 1 3¾	do.
do. do. 12 ins. by 8		0 1 5¾	do.
Circular kerb 4d. per foot extra.			
Granite Pitchings (Aberdeen), 3 ins by 5 ins ...	per ton.	1 15 0	do.
do. do. 3 ins. by 6 ins.	do.	1 14 0	do.
do. do. 4 ins. by 5 ins.	do.	1 14 0	do.
do. do. 4 ins. by 6 ins.	do.	1 13 0	do.
do. (Imperial grey Scotch) 3 ins. by 5 ins.	do.	1 10 0	do.
do. do. 3 ins. by 6 ins.	do.	1 9 0	do.
do. do. 4 ins. by 5 ins.	do	1 9 0	do.
do. do. 4 ins. by 6 ins.	do.	1 7 6	do.
do. (grey Jersey), 3 ins. by 5 ins.	do.	1 7 6	do.
do. do. 3 ins. by 6 ins.	do.	1 6 6	do.
do. do. 4 ins. by 5 ins.	do.	1 6 6	do.
do. do. 4 ins. by 6 ins	do.	1 5 0	do.
do. (blue Guernsey), 3 ins. by 5 ins	do	1 14 0	do.
do. do. 3 ins. by 6 ins.	do.	1 13 0	do.
do. do. 4 ins. by 5 ins.	do.	1 13 0	do.
do. do. 4 ins. by 6 ins.	do.	1 12 0	do.

Slates.

		Current rates.	Rates for similar materials on May 1.
*Best blue Bangor Countess slates	per 1,000 of 1,200	13 0 0	upwards
do. 20 ins. by 12 ins.	do.	13 15 0	
First-quality Bangor Countess slates	do.	12 17 6	
do. 20 ins. by 12 ins.	do.	13 10 0	
do. Ladies	do.	7 5 0	
Permanent green Countess slates	do.	11 10 0	upwards
do. 18 ins. by 10 ins. ...	do.	9 10 0	
do. Ladies	do.	6 10 0	
Best "Eureka" unfading green Countess slates ...	do.	15 15 0	
do. 20 ins. by 12 ins. ...	do.	18 7 6	
do. 18 ins. by 10 ins. ...	do.	13 5 0	
do. Ladies	do.	10 5 0	
Best blue Portmadoc Countess slates	do.	13 10 0	
do. Ladies	do.	6 10 0	

**These prices are for lots not less than 4 tons.*

Tiles.

		Current rates.	Rates for similar materials on May 1.
Plain red roofing tiles ...	per 1,000	2 2 0	
do. hip and valley tiles ...	per doz.	0 3 6	
Best Broseley tiles	per 1,000	2 10 0	
do. ornamental tiles	do.	2 15 0	
do. hips and valley tiles ...	per doz.	0 3 10	
Edwards's (Ruabon) brindled red or brown tiles ...	per 1,000	2 17 6	
do. ornamental do.	do.	3 0 0	
Valley tiles	per doz.	0 3 9	
Hip tiles	per doz.	0 4 0	
Peake's mottled or red Staffordshire tiles	per 1,000	2 12 0	
do. ornamental do.	do.	2 15 0	
Valley tiles	per doz.	0 3 6	
Hip tiles	do.	0 4 0	
Best "Rosemary" plain tiles	per 1,000	2 8 0	
do. ornamental do.	do.	2 10 0	
Valley tiles	per doz	0 3 8	
Hip tiles	do.	0 4 0	
"Hartshill" sand-faced tiles	per 1,000	2 10 0	
do. pressed do.	do.	2 7 6	
do. ornamental	do.	2 10 0	
Valley tiles	per doz.	0 3 5	
Hip tiles	do.	0 4 0	

CARPENTER AND JOINER.

		Current rates.	Rates for similar materials on May 1.
Fir timber best middling Danzic or Riga	per load	4 15 0	
Seconds	do.	4 10 0	
Small timbers (8 ins. to 10 ins.)	do.	3 15 0	
do. (6 ins. to 8 ins.)	do.	3 10 0	
Swedish Balks	do.	3 0 0	
Pitch-pine (average 30 ft.)	do.	4 5 0	
Deals best 3 ins. by 11 ins., 4 ins. by 11 ins., and 4 ins. by 9 ins. (for Carpenters' work) * ... ... per	standard	14 10 0	
For deals 3 ins. by 9 ins. deduct	do.	1 0 0	
For deals seconds deduct...	do.	1 5 0	
Battens, best, 2½ ins. by 7 ins., 2½ ins. by 8 ins., 3 ins. by 7 ins., and 3 ins. by 8 ins.	do.	12 0 0	
For battens 2½ ins. by 6 ins. and 3 ins. by 6 ins. deduct		0 10 0	
For battens seconds deduct from best	do.	0 15 0	
Battens 2 ins. by 4 ins. and 2 ins. by 6 ins.	do.	9 10 0	
do. 2 ins. by 4½ ins. and 2 ins. by 5 ins.	do.	9 0 0	
For foreign sawn boards 1 in. by 7 ins. and 1¼ ins. by 7 ins. add to price of battens	do.	0 10 0	
For ¾ in. do. add	do.	1 0 0	
White Sea first yellow deals 3 ins. by 11 ins. (average price)	do.	24 0 0	
For 3 ins. by 9 ins. deduct	do.	2 0 0	
Second yellow deals 3 ins. by 11 ins.	do.	19 0 0	
For 3 ins. by 9 ins. deduct	do.	1 0 0	
Third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	13 10 0	
White Sea first yellow battens 2½ ins. by 7 ins. and 3 ins. by 7 ins.	do.	17 0 0	
Second do.	do.	13 10 0	
Third do.	do.	11 10 0	
Petersburg first yellow deals 3 ins. by 11 ins.	do.	21 10 0	
For 3 ins. by 9 in. deduct from above	do.	3 0 0	
do. second yellow deals 3 ins. by 11 ins.	do.	16 0 0	
For 3 ins. by 9 ins. deduct	do.	1 0 0	
do. third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	13 0 0	

		Current Rates.
Petersburg battens, 1st	per standard	14 0 0
do., second	do.	11 10 0
do. third	do.	10 10 0
White Sea and Petersburg, first white deals, 3 ins by 11 ins.	do.	14 10 0
For 3 ins. by 9ins. deduct from above	do.	1 0 0
do., second white deals 3 ins. by 11 ins.	do.	13 10 0
For 3 ins. by 9 ins., deduct from above	do.	1 0 0
do., first white battens ...	do.	11 0 0
do., second do.	do.	10 0 0
Pitch-pine deals	do.	19 0 0
Add for less than 2 ins. thick	do.	0 10 0
First yellow pine regular sizes	do.	44 0 0
do., oddments	do.	32 0 0
Second yellow pine regular sizes	do.	33 0 0
do., oddments	do.	28 0 0
American whitewood planks	per ft. cube.	0 4 6
Kauri pine planks	do.	0 4 0
1 in. by. 7 ins. yellow flooring, planed and shot	...per square	0 14 0
Add, if matched	do.	0 0 6
1¼ in. by 7 ins. yellow, planed and matched ...	do.	0 16 6
1 in. by 7 ins., white planed and shot	do.	0 12 6
1 in. by 7 ins., white, planed and matched ...	per square	0 13 0
1¼ in. by 7 ins., do.	do.	0 15 6
⅞ in. by 7 ins., yellow matched boarding, beaded or V-jointed	do.	0 11 6
1 in. by 7 in., do.	do.	0 15 0
⅞ in. by 7 ins., white do. ...	do.	0 10 0
1 in. by 7 ins. do.	do.	0 13 0
For 6 ins. boards deduct from the above prices ...	do.	0 6 0

Hardwoods.

Teak	per load	13 0 0
Danzig and Stettin oak logs (large)	per ft. cubs	0 3 0
do., small	do.	0 2 6
Wainscot oak logs	do.	0 5 9
Dry wainscot oak (in the 1 in.)	per ft. super	0 0 9
⅞ in. do., do.	do.	0 0 7
Dry Honduras mahogany (Tabasco), in the 1 in. ...	do.	0 0 10
do., selected Figury do. ...	do.	0 1 8 upwards
do., American walnut do....	do.	0 0 10

FOUNDER AND SMITH.

Cast-iron columns and stanchions, including patterns	per ton	7 10 0
do., drain pipes, 3 ins. diameter, L.C.C. weights, in 9 ft. lengths, coated with solution	per yard	0 2 4
do., do., 4 ins. diameter ...	do.	0 3 0
do., do., 5 ins., do.	do	0 3 10
do, do., 6 ins., do.	do.	0 4 6
do., do., 9 ins., do.	do.	0 6 3
Rolled steel joists, Belgian (ordinary section)	per ton	5 10 0
do., English	do.	7 0 0
Rolled steel fencing wire...	do.	7 0 0
do., galvanised	do.	9 0 0
Steel compound girders (ordinary section)	do.	9 5 0
Angles, channels, etc., do.	do.	9 5 0
Galvanised sheets, common brands	do.	13 10 0
Wrought-iron gas tubes (current discount off standard lists)	p.c.	65 p.c.
do., water tubes	do.	62½ p.c.
do., steam tubes	do.	57½ p.c
do., galvanised gas tubes...	do.	52½ p.c.
do., do., water tubes ...	do.	50 p.c.
do., do., steam tubes ...	do.	45 p.c.

		Current Rates.
Expanded metal lathing, ⅜ in. mesh (short way) 24 gauge, in quantities of not less than 300 yds. ...	per yard	0 0 10
do., 22 gauge	do.	0 1 3½
do., 20 gauge	do.	0 1 5½
do., ¼ in. mesh, 24 gauge...	do.	0 0 10½
do., 22 gauge	do.	0 1 4½
do., 20 gauge	do.	0 1 6¼

(For quantities of between 300 *and* 700 *yds. deduct approximately* 10 *per cent. from above; for quantities of between* 700 *to* 1,400 *yds., deduct approximately* 15 *per cent.)*

PLUMBER, COPPERSMITH, AND GLAZIER.

		Current Rates.	
Sheet lead, 3 lbs.	per ton	7 4 0	17 10 0
do., above 3 lbs.	do.	16 14 0	17 0 0
Lead water pipe up to 2 in.	do.	7 4 0	17 10 0
Lead barrel pipe	do.	8 4 0	18 10 0
Lead pipe, tinned inside ...	do.	4 1 6	44 7 6
do., and washed outside ...	do.	6 1 6	46 17 6
do., soil pipe, up to 4½ ins.	do.	0 4 0	20 10 0
do., do., to 6 ins.	do.	1 4 0	21 10 0
do., do., above	do.	1 19 0	22 5 0
Lead sash weights	do.	9 14 0	20 0 0
Sheet zinc	do.	8 0 0	upwards
Copper sheets	do.	71 10 0	
do., nails	per lb.	0 0 11	
do., wire	do.	0 0 10	
Plumber's solder	per ton	5 0 0	
Tinman's solder	do.	0 0 0	
Old lead (against account, etc.)	do.	2 0 0	
Clean scrap copper, do ...	per cwt.	2 12 0	2 13 0
Clean scrap brass, do. ...	do.	2 1 0	2 1 6
Old zinc, do.	do.	0 15 0	0 16 6
15 oz. English sheet glass, thirds (in crates)	per foot	0 0 2¼	
do., do., fourths	do.	0 0 1¾	
21 oz. do., do., thirds ...	do.	0 0 3	
do., do., fourths	do.	0 0 2	
26 oz., do., do., thirds ...	do.	0 0 3	
do., do., fourths	do.	0 0 3	
32 oz., do., do., thirds ...	do.	0 4	
do., do., fourths	do.	0 0 3½	
For obscured sheet glass add to fourths	do.	0 0 1	
15 oz. fluted sheet	do.	0 0 3¼	
21 oz., do., do.	do.	0 0 4	
For obscured fluted sheet, add to above	do.	0 0 1	
⅛ in. plain rolled plate ...	do.	0 0 2¼	
3-16 in., do., do.	do.	0 0 2½	
¼ in. do., do.	do.	0 0 3	
For rolled fluted plate add to the above prices ...	do.	0 0 7	

Bankruptcies.

During the week ended May 22nd, twenty-nine failures in the building and timber trades of England and Wales were gazetted.

H. T. Thomas, builder, Neston. R.O., May 11.

T. B. Hughes, builder, Bishopston, Bristol. Adj. May 16.

S. G. Bartlett, painter and paperhanger, Leeds. R.O., May 15.

G. Jackson, plumber, Birkenhead (late Wigan). Adj. May 12.

W. Martin, builder, Exeter. Liabilities, £959; assets, £232.

H. Arnold, late builder, St. George, Bristol. R.O. and adj. May 11.

J Fletcher, joiner and builder, Dore, Derbyshire R.O. and adj. May 12.

F. Dando, haulier, Midsomer Norton. Liabilities, £142 10s.; deficiency £121 10s.

R. Iles, builder and contractor, Fulham. Liabilities, £1,018; estimated assets, £210.

H. Hughes, builder anl contractor, Trelogan, near Holywell. R.O. and Adj. May 14.

O. S. Freck, builders' merchant, Nottingham. Liabilities, £2,123; assets, estimated at £20.

F. J. Parker and R. H. Parker trading as Parker Bros., painters, Derby. Liabilities, £185; assets, £26.

J. Jackson, painter and decorator, Harborne, Birmingham (late trading as Jackson Bros.). Liabilities, £199; assets, £7 7s.

J. Ennor, junr., surveyor, Newquay. First meeting, O.R.'s, Truro, May 28, at 12. P.E., Town Hall, Truro, June 20, at 11.45.

R. G. Minns, builder, Eaton, Norwich. First meeting, O.R.'s, Norwich, May 25, at 12.30. P.E., Shirehall, Norwich, May 27, at 11.

E. Tabor, contractor, Cambridge. First meeting, 14, Bedford Row, W.C., May 25, at 12. P.E., Guildhall, Cambridge, June 17, at 11.

T. Pithie, plumber, Leeds. R.O., May 13. First meeting, O.R.'s, Leeds, May 27, at 11. P.E., C.C., Leeds, June 30, at 11. Adj., May 13.

J. Knight (trading as Jno. Knight and Sons), builder, Chelsea. First meeting, Bankruptcy Court, May 26, at 12. P.E., Bankruptcy Court, June 19, at 12.

J. Jackson, painter and decorator, Guiseley. R.O. May 13. First meeting O.R.'s, Leeds, May 27, at 11.30. P.E., C.C., Leeds, June 30, at 11. Adj. May 13.

H. F. Soper, stonemason, Salisbury. R.O. May 12. First meeting, O.R.'s, Salisbury, May 28, at 2.30. P.E., Council House, Salisbury, June 11, at 2. Adj. May 12.

F. W. Male, builder and contractor, Halesowen. R.O., May 7 First meeting O.R.'s, Dudley, May 25, at 11. P.E., C.C., Stourbridge, May 27, at 2.30. Adj., May 7.

J. Horner, master builder and lodging-house keeper, Leeds. R.O., May 11. First meeting, O.R.'s, Leeds, May 25, at 11. P.E., C.C., Leeds, June 16, at 11. Adj., May 15.

J. T. Hughes, contractor, and haulier's manager, Wolverhampton. First meeting, O.R.'s, Wolverhampton, May 26, at 11. P.E., C.C., Wolverhampton, May 27, at 11.

W. Hutchinson, carpenter and wheelwright, Wimblington, Cambs. First meeting, Griffin Hotel, March, Cambs., May 23, at 2. P.E., Law Courts, Peterborough, June 12, at 12.

A. J. Harris and R. Sellen (trading as the Decorators' Supply Co., and the Harlen Wallpaper and Colour Co.), paint, colour, and wallpaper merchants, etc. R.O. and Adj. May 11.

J. Phillips, carpenter, wheelwright, and contractor, Great Mongeham, near Deal. First meeting, O.R.'s, Canterbury, May 28, at 9.15. P.E., Guildhall, Canterbury, May 28, at 10.

J. T. Jackson, journeyman plumber, and H. Kassell, journeyman plumber (late trading as Jackson and Kassell, plumbers), Castleford. R.O., May 12. First meeting O.R., Wakefield, May 27, at 11. P.E., C.C., Wakefield, June 4, at 11. Adj., May 12.

H. Kelsey (trading as Kelsey and Co.), wallpaper merchant and decorator, Sheffield. R.O., May 13. First meeting, O.R.'s, Sheffield, May 27, at 11.30. P.E., C.C., Sheffield, June 4, at 2. Adj., May 13.

E. English, journeyman painter, late painter and decorator, Huddersfield (late Peterborough). R.O. and Adj., May 11. First meeting, Huddersfield Incorporated Law Society's Room, Huddersfield, May 28, at 2. P.E., C.C., Huddersfield, July 20, at 2.

The Erection of Crematoria in Germany has apparently received a serious check. A recent judicial decision not only pronounces that cremation cannot be introduced into Prussia without special legislation, but makes it very doubtful whether crematoria in the other constituent parts of the Empire do not infringe the Imperial law. At present fire burial is permitted in twelve of the German Federated States.

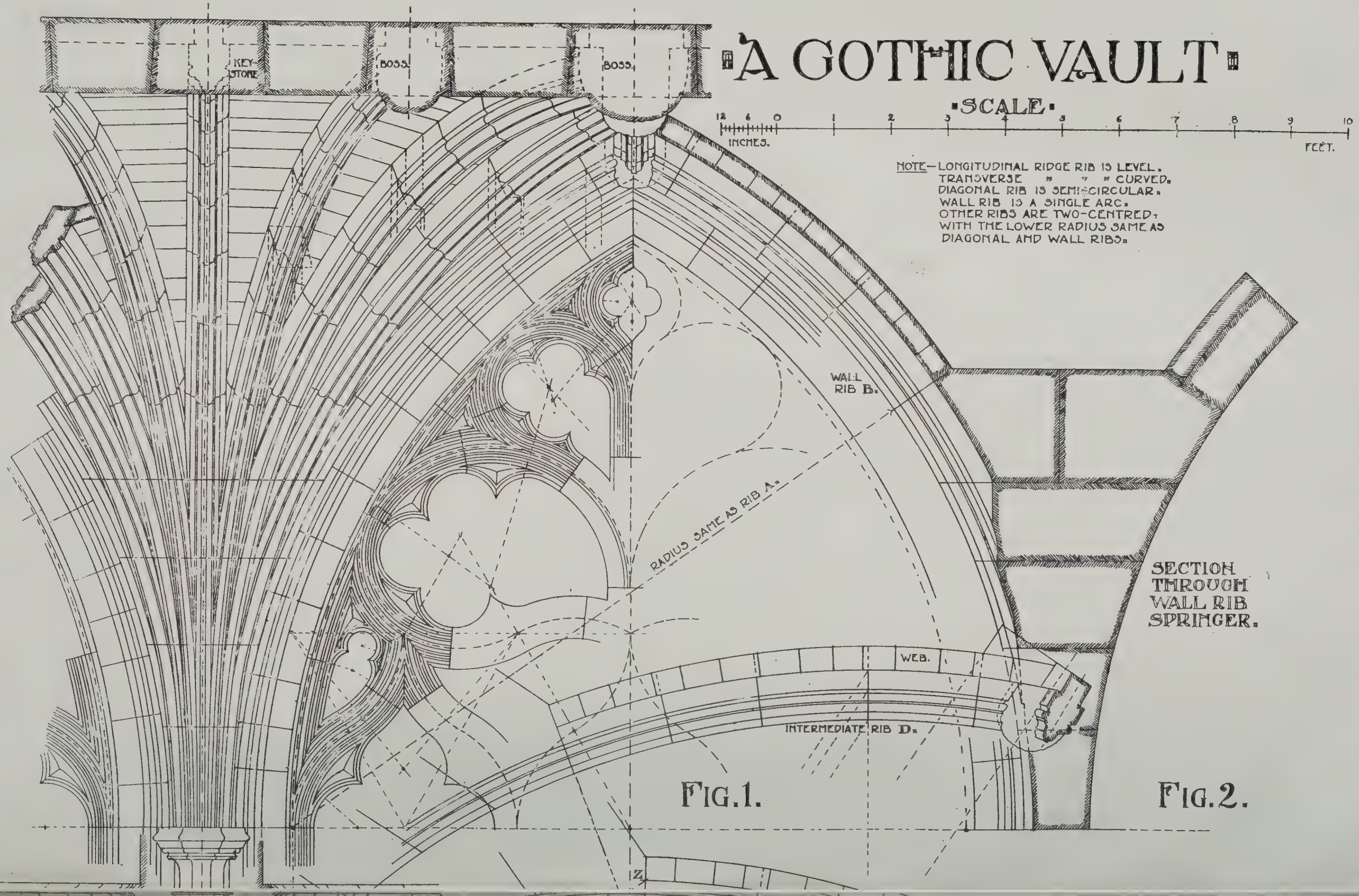

A GOTHIC VAULT
SCALE
12 6 0 1 2 3 4 5 6 7 8 9 10
INCHES.
FEET.
NOTE—LONGITUDINAL RIDGE RIB IS LEVEL.
TRANSVERSE " " " CURVED.
DIAGONAL RIB IS SEMI-CIRCULAR.
WALL RIB IS A SINGLE ARC.
OTHER RIBS ARE TWO-CENTRED, WITH THE LOWER RADIUS SAME AS DIAGONAL AND WALL RIBS.
KEY-STONE
BOSS
BOSS
WALL RIB B.
RADIUS SAME AS RIB A.
WEB.
INTERMEDIATE RIB D.
SECTION THROUGH WALL RIB SPRINGER.
Z

FIG.1.

FIG.2.

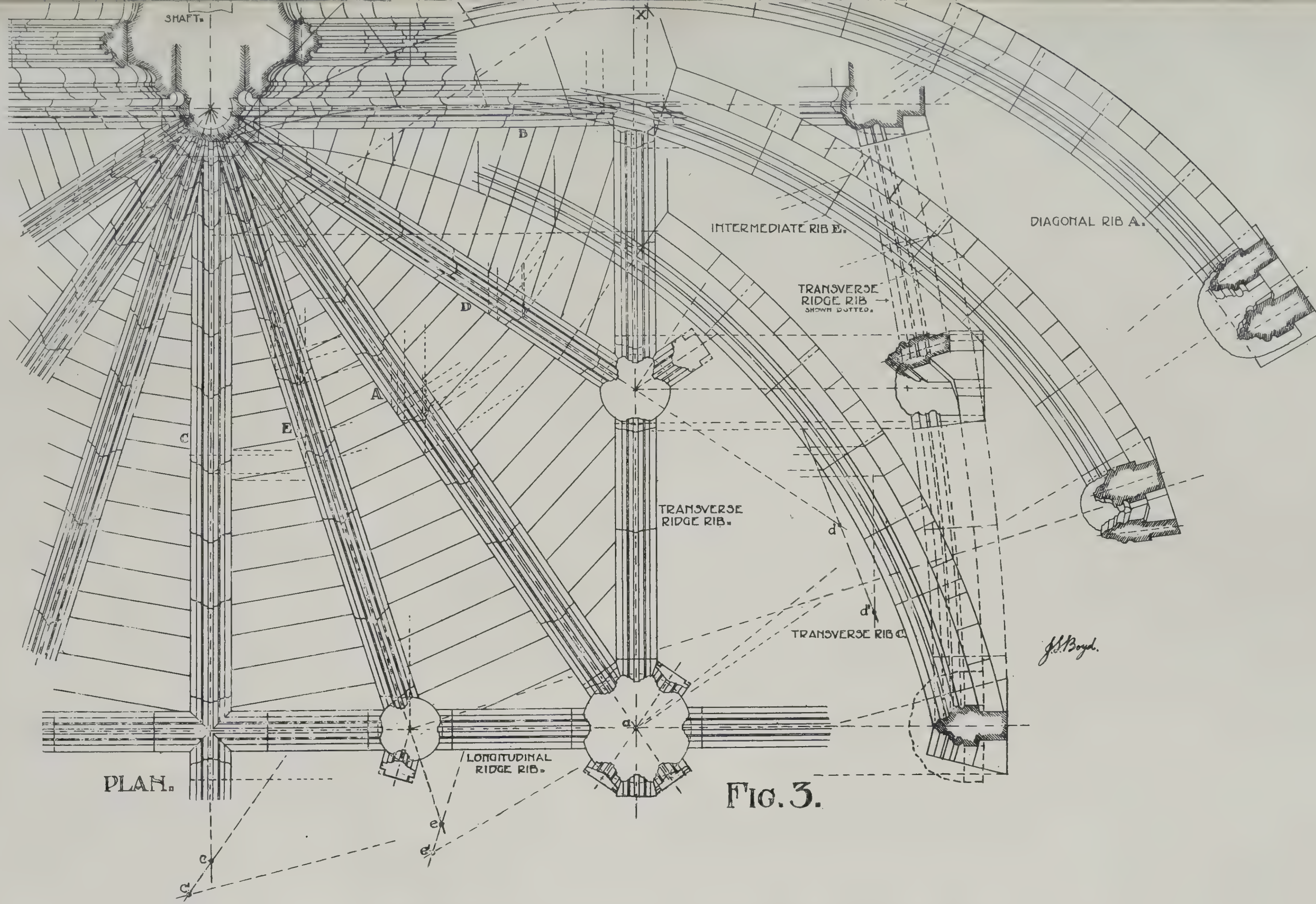


FIG. 3.

(Illustrating the article on "The Construction of a Gothic Vault," by Jas. S. Boyd, in this issue.)

June 3, 1908. Volume 28, No. 695.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

The Suggested Minister of Fine Arts. The question raised last week in the House of Commons by Sir G. Robertson relative to the desirability of creating a Minister of Fine Arts, who would either be in charge of a separate department (in which case he would receive the assistance of an expert advisory board) or, as an alternative, would hold the post in connection with other duties, such as those now belonging to the office of Chief Commissioner of Works, is one of vital importance to the welfare of the community. The fact that this country should have been content for so many years past to lag far behind other nations—most of which have benefited by the work of a properly constituted government department, organised for controlling the erection of new buildings, and the formation of new streets and thoroughfares—is little short of amazing. How little the Government realises in this respect the extent of its duties to the nation may be gauged by Mr. Asquith's reply to Sir G. Robertson, in which he advanced the opinion that the creation of a new office would be of doubtful advantage, and would lead to an undoubted increase of expense. Mr. Asquith also expressed the opinion that the duties referred to, so far as the State could usefully undertake them, were at present adequately discharged by the First Commissioner of Works. But, notwithstanding the Prime Minister's evident lack of sympathy with Sir G. Robertson's proposal, we sincerely trust that the last word has not yet been uttered in the House of Commons in favour of the formation of a Government department invested with the powers necessary to enable it to put an end to the many acts of vandalism now committed with impunity by municipal and other public bodies, which too often result in the permanent disfigurement of our streets and civic buildings.

M. Hulot's Prix de Rome Drawings. The Council of the Royal Institute of British Architects are fortunate in being able to arrange an exhibition of the extremely fine drawings made by M. Jean Hulot during his tenure of the Grand Prix de Rome. These drawings, which were exhibited at last year's Paris Salon, comprise a series of studies for M. Hulot's restoration of the ancient fortified port of Selinus. The exhibition is to be held in the gallery of the Old Water Colour Society, Pall Mall East, from July 13th to July 20th; and the committee having the matter in hand hope to induce M. Hulot to give a paper explanatory of his work. It was a happy thought on the part of the Council of the Institute thus to make the most of an opportunity of showing M. Hulot's masterly specimens of architectural draughtsmanship.

A Great Opportunity. It is announced that the central block of the great building site provided by the closing of the old George's Dock at the Pierhead, Liverpool, has been sold to Mr. William Cubitt, of London, who proposes to erect thereon a large office building. The architect mentioned in connection with this building, which is estimated to cost between £250,000 and £500,000, is Mr. Aubrey Thomas, of Liverpool, who has designed the huge Royal Liver building, which occupies the site immediately to the north of the central block, while on the opposite side is the great new building of the Mersey Docks and Harbour Board. The amount agreed upon for the central site is stated to be £12 per yard super., or about £85,000. There is no question that this site makes it possible to carry out a magnificent architectural scheme, and it is to be hoped that so great an opportunity will not be missed.

Marble Work for the Queen Victoria Memorial. It will be recollected that a short time ago a petition from 50,000 working men was presented to the Home Secretary praying that the marble work in connection with the National Memorial to Queen Victoria, now in course of erection in front of Buckingham Palace, should be executed by British workmen, instead of being worked at the quarries by Italians. Mr. Gladstone was unable to advise His Majesty to take any action in the matter, for reasons already set forth in our columns. That there are two sides to this subject, however, is clearly shown by the letter which the Hon. Claude G. Hay, M.P., has sent to the Home Secretary. In the course of this letter Mr. Hay says: "I beg to point out to you:—That the work to which attention was called is not the sculptured portion of the memorial, but that which a skilled mason of ordinary capacity is perfectly competent to execute; That a large number of British workmen skilled in the working of extremely hard marble, many of whom are now out of employment, can be found in this country; That so far from a better result having been obtained by the employment of foreign workmen, the fact is that a number of British workmen have been employed to set right the errors discovered after the material was imported in a manufactured state: That the statement that the working of the material in Italy has saved the great expense of importing over a thousand tons of raw material, which in the course of working would have to be discarded owing to defects, cannot have received careful consideration, as this weight of material is the total amount required for this portion of the work, and the statement would imply that the whole of it would be likely to be discarded: That there would be no difficulty in obtaining the most careful selection of the raw material, both before shipment and after arrival, if it were imported into this country in that condition: That it is usual to insert a clause in a public contract binding the contractor to pay such rate of wages as may be considered fair by the trades unions of the district in which the work is carried out: That such a clause was eminently desirable in a contract for such work which is a national memorial to a great British Queen, the cost of which was defrayed by subscriptions from British subjects throughout the Empire: That the wages of masons in Italy are considerably lower than those current in this country, and it is submitted that the principal reason for importing the work in a manufactured state is the saving of cost by the employment of Italian labour, but that such a course of action tends not only to increase the want of employment, but also to lower the wages and the standard of comfort of the British workman: That in no other country in the world are the imports of Italian marble in a raw state increasing proportionately to the import in a manufactured state except in this country: That according to the returns of the Italian Government the export from that country of marble in its rough state to the United Kingdom decreased during the past ten years by 62 per cent. (The imports of Italian marble in a manufactured and partly manufactured state increased by 60 per cent. During the same period the exports of Italian marble in a rough state to the United States increased by 150 per cent., whilst to the same country the increase of marble in a manufactured and partly manufactured state only increased by 13 per cent.) That these figures, startling as they are, do not convey the full extent of the loss to British labour, as the returns of the Italian Government

are made in tons weight, and not in value. (If the value could be obtained, the result would show a far greater proportionate loss to British labour than the official figures indicate.) That the result of the decreased import of the raw material into this country and the increased import of material in the manufactured state is that a large number of men are thrown out of employment as skilled workmen. Under these circumstances, recognising the fact that the building and masonry trade in this country is at present suffering from very severe depression, and lack of employment is general, I trust you will be able to reconsider your decision."

A Reinforced Concrete Failure. Although results of a highly satisfactory character have been obtained by the adoption of reinforced concrete as a method of building construction, yet the recent fatal accident at Milan points to the existence of certain dangers attendant on its use. The case to which we refer (reported in "Il Secolo" of April 16th last) was that in which a builder and his foreman were indicted for having occasioned the death of one workman, and serious injury to another, by the negligent construction of a reinforced concrete beam (*un architravo in cemento armato*). In the House of Commons on May 27th, Sir F. Dixon-Hartland drew attention to this disaster in asking the First Commissioner of Works whether, in view of the accident, it was intended to employ a similar system of construction at the National Gallery and other buildings. Mr. Harcourt's reply was to the effect that, with regard to the accident in question, there was nothing incidental to that unfortunate occurrence which would make him hesitate to use the best system of reinforced concrete both at the National Gallery extensions and elsewhere. Whilst we agree with the general conclusion at which Mr. Harcourt has arrived, yet we think this latest accident may well serve to remind architects who are about to use a novel method of construction, with the limitations and exigencies of which they may not be altogether conversant, that they are simply courting disaster if they omit to have the work executed under the close supervision of a practical and theoretical "expert."

The Irish Outlook. Mr. R. M. Butler, the outgoing president, delivered his valedictory address to the Architectural Association of Ireland last week. After referring to the founding of the Georgian Society in Dublin, the object of which is to preserve a record of eighteenth-century architecture in that city, Mr. Butler went on to speak of the great depression in building work throughout the country. He said the outlook before the profession in Ireland was not very pleasing, though they should hope for the best, and reflect that if the work were scarce it left them all the more leisure to do the very best that was in them! Continuing, he said the air was charged with the talk of universities, colleges, and educational schemes, and their minds were, naturally, directed to a consideration of what educational benefits such changes might bring to their profession in Ireland—innocent, as they were at present, of any educational curriculum. He hoped they might never find the control of architectural education passing out of the hands of the profession into that of either universities or technical institutes. Their natural thoughts and aspirations should be towards a reconstituted and enriched Hibernian Academy, where sculptors, architects, and painters might work together, and derive mutual inspiration and help. Registration, too, in some shape or another, seemed almost essential to their continued existence in Ireland as a profession.

Notes and News.

The Northern Centre of the Conciliation Board for the Building Trades at its annual meeting, which was held in Manchester last week, appointed as its president Mr. T. Wilkinson, of Middlesbrough, and as its vice-president Mr. D. Richards, J.P., of Southport.

* * *

An Exhibition of Students' Designs.—The drawings submitted by students in the various competitions of the Society of Architects are on exhibition this week (from 10 to 8) in the rooms of the Society at Staple Inn Buildings, Holborn. The chief competition is that for the Travelling Studentship, value £25, the subject of which this year was a free library on the open access system, to cost £5,000: the competition was won by Mr. W. J. Walton, of Blackpool, and a special prize of £10 was awarded to Mr. W. T. Davies, of London, for the design he submitted.

* * *

Southwark Bridge Rebuilding Scheme.—The members of the Bridge House Estates Committee met at the Guildhall recently for the purpose of receiving plans and designs for the reconstruction of Southwark Bridge. Mr. Basil Mott, the engineer consulted by the Corporation, explained the methods which would be employed for the adequate widening of the present structure and the reduction of the steep gradients on the north side, which have hitherto made Southwark Bridge a place for avoidance by vehicles. The committee resolved to receive a deputation from the London County Council, whose views on the subject have been sought. The estimated cost of the proposed reconstruction varies between £800,000 and £1,000,000, which sum will be paid out of the Bridge House Estates.

* * *

The Log and Lumber Industries of Canada are shown, in an official publication that has been recently issued ("Census and Statistics: Bulletin II., Manufactures of Canada"), to employ far more labour and capital than any other form of activity in the Dominion. Of the 12,547 establishments of all kinds throughout Canada, each employing five or more persons, 1,321 establishments were engaged in log products, and 482 in lumber products. The former industry employed, according to the census of 1905, 53,270 persons; the latter, 12,901 persons: a total of 66,171 out of a grand aggregate of 383,921 employees in all the industries tabulated. The value of the log products is stated at 67,112,286 dollars; that of the lumber products at 20,528,667 dollars; or a total of 87,640,953 dollars, out of a grand aggregate for all industries of 706,446,578 dollars. Another table shows that "timber and lumber and their remanufactures" employed 77,968 wage-earners, and that the value of the year's products was 109,500,970 dollars.

A SIDELIGHT ON MICHAEL ANGELO.

In the brilliantly written and scholarly book, by Professor Lanciani, entitled "The Golden Days of the Renaissance in Rome" much light is thrown upon the daily life and environments of some of the world's greatest artists whose work is coeval with one of the most engrossing of the many interesting periods to be found in the historical and artistic annals of the Eternal City.

It required a stern, unbending, masterful character to properly cope with the constant intrigues and corruption of the officials by whom the successful artist of the day was surrounded whilst engaged upon work of a public nature. Many of these officials or "deputies" appeared indeed to consider it part of their duty to regularly thwart the artist's views and to oppose his suggestions. For instance, soon after his appointment to the direction of the work, in January 1547, Michael Angelo commenced his long series of struggles with the deputies of the Fabbrica di San Pietro. Unlike his predecessors, Raphael, Fra Giocondo, and Baldassare Peruzzi, Michael Angelo was a man of determined character and iron will (as a document, preserved in the Chigi Library, containing the deputies' description of the state of affairs existent in 1555, proves):—"From the year 1540, when the rebuilding of St. Peter's was resumed with new vigour, to the year 1547 when Michael Angelo began to do and undo, to destroy and rebuild at his own will, we have spent 162,624 ducats. From 1547 to the present day (1555), during which time we deputies of the Fabbrica have counted absolutely for nothing, and have been kept by Michael Angelo in absolute ignorance of his plans and doings, because such was the will of the late Pope Paul III. and of the reigning one (Julius III.), the expense has reached the total of 138,881 ducats. As regards the progress and the designs and prospects of the new basilica, the deputies know nothing whatever, Michael Angelo despising them worse than if they were outsiders. They must, however, make the following declaration to ease their conscience; they highly disapprove Michael Angelo's methods, especially in demolishing and destroying the work of his predecessors. This mania for pulling to pieces what has been already erected at such enormous cost is criticised by everybody. However, if the Pope is pleased with it, we have nothing to say." But in his unyielding determination to destroy such of the work of his predecessors as he considered unsuitable for the design he had in view, Michael Angelo was undoubtedly pursuing the only possible course open to enable him to weld the medley of walls and piers constructed by former architects into a homogeneous and stately building. Already, remarks Professor Lanciani, "he had conceived the glorious outline of the cupola which was to be raised to double the height of the dome of the Pantheon; he could see the gilt angel with outspread wings soaring in the pure Roman sky above the globe which now supports the cross; and as Bramante's piers were obviously inadequate to stand the weight, he destroyed whatever obstacle barred his way, to the great mortification of the Fabbricieri, who could think only of the financial side of the case."

Again, when Cardinal Cervini (afterwards Pope Marcel II.) attempted to

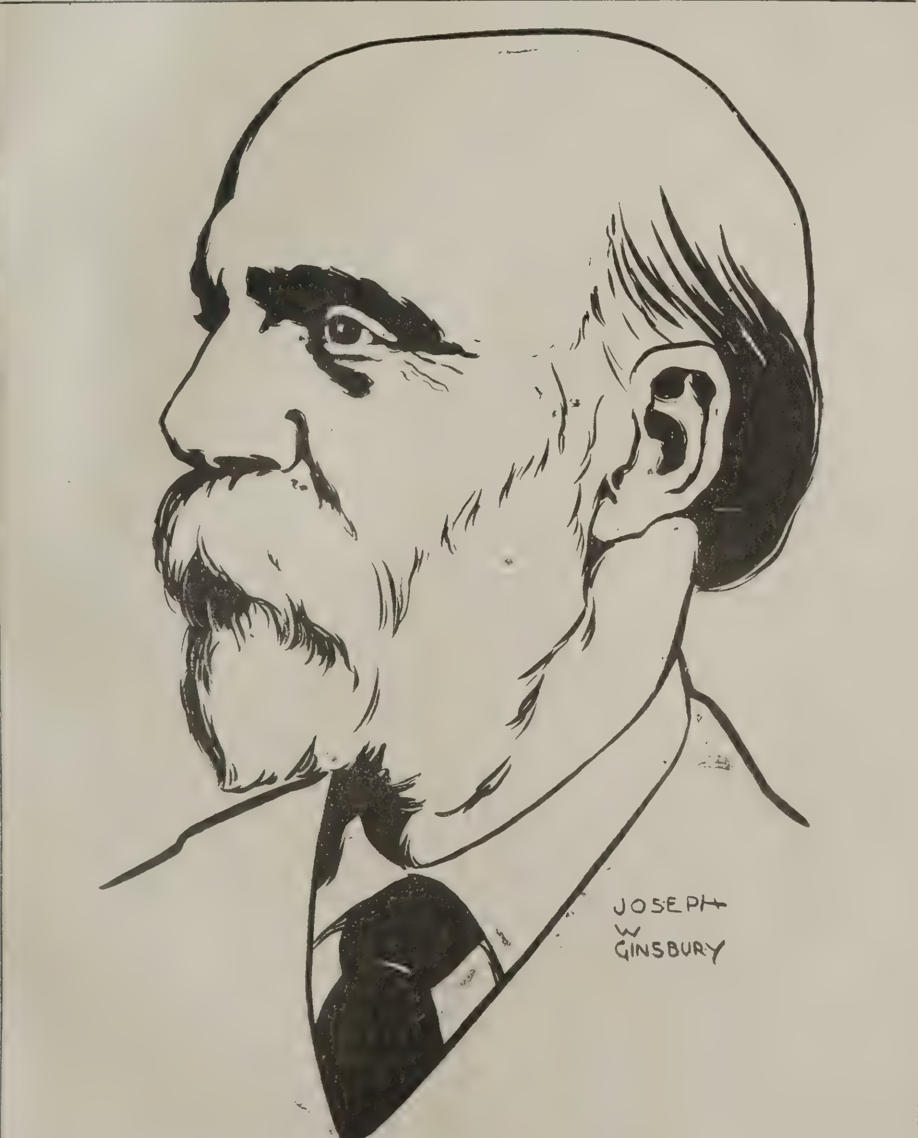
remonstrate, Michael Angelo made the following characteristic reply: "I am not, and will not be, obliged to tell either you or any of the deputies what I expect to do. Your only business is to collect and administer the funds and to see that they are not squandered or stolen; as regards plans and designs, leave that care to me."

Here is a letter from Michael Angelo to the "overseers" of the Fabbrica di San Pietro, from which it seems that even in "the golden days" the supervisors of a building were not above accepting bribes from the various contractors, and that then, as now, it sometimes happened that they would shut their eyes at a time when their fullest vigilance was required. On one of these occasions the indignant architect wrote to them as follows:

"You know very well I told Balduccio not to send the supply of lime (cement) unless of the first quality. The fact that he has sent a very inferior article and that you have accepted it makes me suspect that you must have come to an understanding with him. Those who accept supplies which I have refused connive with and make friends of my enemies. All these pourboires and presents and inducements corrupt the true sense of justice. I beg of you, therefore, in the name of the authority with which I have been invested by the Pope, not to accept henceforth any building materials that are not perfect, even if they come from Heaven" (*se ben la venissi dal cielo*).

Michael Angelo's absolutely incorruptible character, united with the consciousness of his own artistic value, made him view with contempt and disgust the intrigues and corruption of the officials by whom he was surrounded. His uncompromising attitude created extremely bitter opponents, and, perhaps, on occasions, actually endangered his life, for in those days few architects were free from the jealousy of rivals or from the real or imaginary grievances of their subordinates.

The herculean frame and mighty spirit of Michael Angelo, however, survived both the struggles of his time and the troubles of his life, and on his death his memory was honoured by the universal admiration expressed for his intellectual pre-eminence, and by the wide-spread genuine feeling of sorrow evoked by the passing of a mighty artist.



MR. ERNEST GEORGE, THE NEW PRESIDENT OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE NEW PRESIDENT OF THE INSTITUTE.

A Biographical Note.

Mr. Ernest George, the new president of the Royal Institute of British Architects (whose election was announced on Monday evening), was born in London in 1839. He was articled to Mr. S. Hewitt, of Buckingham Street, in 1856, and gained the Gold Medal for Architecture at the Royal Academy in 1859. Two years later he joined a fellow Academy student, Thomas Vaughan, and they began practice together. In 1875 Mr. Vaughan died. A year later Mr. George was joined by Mr. Harold Peto (a son of Sir Morton Peto). The practice was continued under "Ernest George and Peto" until 1891, when Mr. Peto retired. Mr. Alfred Yeates then became partner with Mr. George, and the practice is still carried on under the style of "Ernest George and Yeates" at 18, Maddox Street, W.

Mr. George's name is chiefly associated with domestic work, many large houses in country and town having been erected from his designs. Among the former may be mentioned Rousdon, Devon, for Sir Henry Peek, with the church, schools, farm buildings, etc.; Stoodleigh Court, Tiverton; Batsford Park, Gloucester; Shiplake Court, Henley; Poles, Ware (Herts); Motcombe, Dorset; Dunley Hill, Dorking; Colworth, Bedford; West Dean, Sussex; Ruckley Grange, Shropshire; Crathorne Hall, Yorks; Busbridge Park, Surrey; Eynsham Hall, Oxon; Glencott, Wells; Edgeworth Manor, Cirencester; North Mimms, Herts; Buchan Hill, Crawley; Reedesdale Hall, Moreton-in-Marsh; and the reconstruction and decoration of Welbeck Abbey for the Duke of Portland.

Mr. George's town houses are to be found in many West End squares and thoroughfares, included among these being houses in Harrington Gardens, South Kensington; about twenty houses in Collingham Gardens; the "Yellow House" on Bayswater Hill; and houses in Mount Street, Berkeley Square, and Cadogan Square. A characteristic house is "Redroofs," Streatham, where Mr. George himself resided for many years.

In the City his works comprise 46, Cheapside and the Royal Exchange Buildings, of which a portion only has as yet been erected.

Other buildings erected from his designs are the Ossington, Newark; the crematorium at Finchley Road; churches at Rousdon, Streatham (St. Andrew's), and churches abroad in Switzerland and at Samaden Tarasp and Arolla.

In 1896 Mr. George was awarded the Royal Gold Medal for Architecture.

In addition to purely architectural work, Mr. George devotes himself to water-colour painting, examples of which are regularly exhibited at the Academy, while his studies in Continental and Arab cities have been shown from time to time at the gallery of the Fine Arts Society. He was for many years a member of the Royal British Artists, and also a member of the Painter Etchers. He has published "Etchings of the Loire"; "Etchings on the Mosel"; "Etchings in Belgium," "In Venice," and "In Old London."

Mr. George is a member of the Arts Club.

He married in 1866, and of his family living, there are three sons and two daughters, the youngest son being now in practice with his father.

R.I.B.A.

Election of Council and New Fellows.

A meeting of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W., the chair being occupied by the president, Mr. T. E. Collcutt.

The report of the scrutineers appointed to direct the election of the council, standing committees, etc., for the year of office 1908-9, was received, as follows:—

President.

Ernest George.

Vice-Presidents.

J. S. Gibson. E. T. Hall.
J. W. Simpson. Leonard Stokes.

Hon. Secretary.

Alexander Graham.

*Members of Council.**

Reginald Blomfield.
J. J. Burnet.
A. W. S. Cross.
E. Guy Dawber.
W. Flockhart.
J. A. Gotch.
E. A. Gruning.
Henry T. Hare.
George Hubbard.
H. V. Lanchester.
E. L. Lutyens.
Mervyn E. Macartney.
Ernest Newton.
W. A. Pite.
A. N. Prentice.
Halsey Ricardo.
John Slater.
Paul Waterhouse.

*33 nominations for 18 places.

Associate Members of Council.†

H. A. Crouch.
W. Curtis Green.
Sydney K. Greenslade.
Stanley Hamp.

†10 nominations for 4 places.

Representatives of Allied Societies.

Frederick Batchelor (R.I. of Ireland).
George Bell (Glasgow Institute).
Hippolyte J. Blanc (Edinburgh A.A.).
G. T. Brown (Northern A.A.).
J. Crocker (Devon and Exeter).
T. E. Eccles (Liverpool Society).
Mowbray A. Green (Bristol Society).
A. E. Heazell (Nottingham Society).
Paul Ogden (Manchester Society).

Representative of Architectural Association.

Walter Cave.

Art Standing Committee.

John Anderson	S. K. Greenslade
R. S. Balfour	Henry T. Hare
A. T. Bolton	W. R. Lethaby
T. Davison	E. S. Prior
E. Guy Dawber	E. A. Rickards
W. Flockhart	J. W. Simpson
W. A. Forsyth	W. J. Tapper
J. S. Gibson	Edgar Wood

Literature Standing Committee.

F. Chatterton	F. M. Simpson
A. W. S. Cross	R. Elsey Smith
J. A. Gotch	R. Phené Spiers
W. Curtis Green	Hugh Stannus
G. Hubbard	Arthur Stratton
H. Passmore	W. Henry Ward
E. S. Prior	Paul Waterhouse
Halsey Ricardo	P. Leslie Waterhouse.

Practice Standing Committee.

W. H. Atkin-Berry.	H. Porter.
Max. Clarke.	T. E. Pryce.
A. W. S. Cross.	John Murray.
E. Greenop.	A. Saxon Snell.
E. R. Hewitt.	H. Tanner, Junr.
G. Hubbard.	A. W. Tanner.
H. H. Langston.	W. Henry White.
Sydney Perks.	William Woodward.

Science Standing Committee.

H. Percy Adams.	F. W. Newman.
H. W. Burrows.	C. Stanley Peach.
Max. Clarke.	Sydney Perks.
William Dunn.	A. Saxon Snell.
Bernard Dicksee.	H. D. Searles-Wood.
Matt. Garbutt.	D. Solomon.
Francis Hooper.	H. Inigo Triggs.
A. E. Munby.	E. W. M. Wonnacott.

New Fellows and Associates.

The following new Fellows were elected:—

John Brooke (Manchester).
A. Morris Butler (London).
F. E. P. Edwards (Bradford).
F. M. Elgood (London).
G. McLean Ford (London).
E. A. Runtz (London).

The following new Associates were elected:—

J. J. Beck (Toronto, Canada).
S. B. Birds (Toronto, Canada).
H. J. Venning (London).

Hon. Associate.

Prof. Gerald E. Moira was elected an Hon. Associate.

VIENNA CONGRESS RESOLUTIONS.

As a social function, the eighth International Congress of Architects was doubtless fully as successful as its forerunners; but, from beginning to end, it remained true to type in producing no thesis or manifestation or proposition of really vital interest, of first-class importance, although there was certainly a good deal of more or less vapid and perfervid talk about artistic aspirations and ideals. Such rhetoric doubtless has its uses, but it yields no immediate practical outcome. The papers read were in very few instances distinguished by the scholarship and catholicity that an international congress seems to demand. Among the papers that escaped (though in some instances rather narrowly) this condemnation was that by Professor Mayreder, of Vienna, who gave an instructive and a comprehensive comparison of the respective building regulations in force in Berlin, London, Paris, Rome, and Vienna, with particular regard to their effect on architectural finish; that by Dr. Eros, of Budapest, who gave a genuinely international survey of the laws of various countries with respect to artistic copyright, particularly with relation to architecture, and who showed that Belgium and Denmark are far ahead of other countries in the protection afforded to architectural designs; and that by Professor Dolezal, of Vienna, which was an interesting and suggestive account of what has been, is being, and might be done by systematic photometric surveying of architectural monuments. Of more practical and almost equally general interest were the reports by M. Medgyaszay and M. de Wielemans on the developments of reinforced concrete construction.

Architectural Copyright.

There were of course, the usual discussions on architectural copyright, on the preservation of historical monuments, and on the status of the architect. With regard to architectural copyright, a resolution to the following effect, proposed by M. Harmand, was adopted unanimously: "(1) That architectural designs, comprising the designs of facades, 'exterior and interior,' and the plans, sections, and elevations, constitute the original idea of the architect and the creation of a work of architecture; (2) that the actual building is essentially a reproduction, on the site, of the architectural design; and that therefore a work of architecture, and all the designs of which it consists, should severally and collectively receive, in all legislation, and in all international conventions, equal protection with all other artistic works." The resolution with regard to the preservation of monuments was: "The governments of all civilised states are invited to give particular care to the preservation of the artistic and historical monuments existing within their respective countries, to establish official registers of such monuments, and to create legal enactments for their protection."

The Status of the Architect.

The resolution concerning the status of the architect, proposed by M. Berindey, of Roumania, was adopted in terms that may be thus translated: "The decision establishing the right to practice as an architect is reserved to the *Chambres Syndicales des Architects.* In order to become entitled to assume the style of architect, it is absolutely necessary (1) To have directed works practically during a minimum period to be fixed by the Chamber of Architects; (2) To pass an examination as 'director of construction,' giving state authorisation to direct (*seul et sous responsabilité*) of works of construction; such examination to be conducted by a commission to which representatives of the Chamber of Architects shall be added; (3) To be a member of the Chamber of Architects." There was also a resolution in favour of every Government establishing a Ministry of Fine Arts, which was brought forward in an able address by Herr Alois Wurm.

At the grand banquet with which the congress concluded, "*M. Stockes* (*Angleterre*)" was, we note with pleasure, one of the speakers most heartily applauded by the "600 *convives*" who assembled at the Hotel Continental; for under this thin disguise there is but little difficulty in recognising the sturdy British form of Mr. Leonard Stokes, and it is gratifying to find that his neat gift of post-prandial oratory was properly appreciated.

Writing in reference to the Congress, Mr. Ellis Marsland, hon. secretary of the Society of Architects, says:—

"The general facts in regard to the representation of England at the Vienna Congress are correctly set forth in your columns. The writer, however, has omitted to state that the only English body of architects officially represented at the Congress was the Society of Architects, of whom I was the delegate, and the only society allied to architecture was the British Fire Prevention Committee. It is to be regretted that there should have been so small a representation, but I should like it to be recorded that, whatever were the shortcomings of other bodies, the Society of Architects responded to the invitation of their Vienna confrères and were duly represented."

"CONCRETE: ITS USE IN BUILDING."—A new edition of this book, by Mr. Thomas Potter, re-written and brought up to date, is in the press, and will shortly be published by Mr. Batsford. The last edition was published in 1891.

THE NATIONAL UNION OF PUBLIC HEALTH AUTHORITIES, recently held its first meeting at the Caxton Hall, Westminster, Alderman Newton (Newcastle-on-Tyne) being voted to the chair. The union was formed some few months ago. The chairman said that the object was the formation of one great union of public health workers. The draft constitution was then submitted, showing that the object of the union was to secure harmony and uniformity of action among public health authorities for the purpose of obtaining certain necessary sanitary reforms, and of educating public opinion as to the importance of health work generally. The draft constitution was adopted, and Alderman Newton was unanimously elected the first president, Councillor Solomon (Swansea); vice-president, Councillor David Adams (Newcastle-on-Tyne) honorary secretary; and Dr. Meridith Young, acting secretary. The next meeting was fixed for November.

THE CONSTRUCTION OF A GOTHIC VAULT.*

BY JAS. S. BOYD.

Although it may be said that the study of Gothic vaulting is now chiefly limited to the archæological side of the subject, still, the architectural student and craftsman of the present day cannot afford to entirely disregard it. It is exceedingly interesting to study the construction of Gothic vaulting from the old buildings themselves, and to speculate as to the probable constructional methods of the builders of that great bygone age. As it is from its construction that the forms and proportions of any structure are derived, and upon which they are dependent, unless we thoroughly understand these constructions and methods it may be impossible for us to discover the master-key to their constructive principles.

The following paper must be considered an attempt not merely to describe how a Gothic vault would be constructed at the present time, but also to bring under notice a few of the constructional and geometrical methods which, apparently, were used in mediæval days, and which have been found from the scrutiny of old examples.

A Gothic vault is a vault the ribs of which intersect, and whose thrusts are principally counteracted by buttresses. Such a ribbed vault consists of an arrangement of stone arches or ribs, each of which is worked in the same manner as a cylindrical arch. Upon the backs of these arches rest the voussoirs or infilling of the compartment.

In the ancient Roman and Renaissance vaults, the groins of which have no ribs, the chief feature is the vaulting surface, the disposition of which is the only object requiring attention. In Gothic ribbed vaults, on the other hand, the ribs are the main features, the infilling surface of the vaults being subordinate.

Much good resulted from the substitution of arches for the sharp arrises of the groins. In the first place, the amount of centering required for the support of the vault infilling was much lessened. Another benefit arising from the use of ribs to support the voussoirs of the vault was that the infilling of each cell had a considerable amount of "play," enabling the courses to accommodate themselves to the varying nature of the thrusts in the ribs. Evidence of this elasticity can be seen in most Gothic vaults: in the Blackader crypt of Glasgow Cathedral great distortion is noticeable both in the infilling and the ribs.

Again, in a groined vault, the groins were difficult to construct, and were always a source of weakness, which defect was got rid of by adding ribs to support the groins.

Irregularity of the vaulting surface is a fixed and indispensable characteristic of Gothic vaults, such vaults never having the form of simple intersecting pointed cylindrical vaults.

The limits of this paper will not permit me to enter into a description of the different varieties of vaults in the decorative sense, neither is it necessary for me to do so.

Each vaulted compartment has ridges running in both directions—transversely and in a line parallel with the axis of the building.

* A paper read before the Glasgow Technical College Architectural Craftsmen's Society on January 31st, 1908.

Types of Ribs.

The various ribs employed in Gothic vaulting (see Figs. 1, 2, and 3 on the centre plate in this issue) are:—

(1) Transverse ribs, which are set at right angles to the nave or aisles (see plan, Fig. 3); (2) longitudinal ribs, parallel to the nave or aisle axes (when used on the walls of a side aisle they are termed wall ribs, and when used in the high vault they are sometimes called clerestory ribs); (3) diagonal or groin ribs, which, as the names imply, stand over the diagonals or groins of the compartment (it is upon these that the main strength of a Gothic vault depends); (4) intermediate ribs or *tiercerons*, which are introduced between the transverse and diagonal ribs, and between the longitudinal and diagonal ribs; (5) ridge ribs, occupying the ridges of the vaults, and used in vaults with or without intermediate ribs; (6) liernes, which are short ribs introduced between the principal ribs (these do not occur in the vault under consideration, and will not be referred to further in this paper).

Ribbed vaults may have horizontal ridges with the infilling in straight courses, or the ridges may be curved, giving the infilling a domical form. Domical vaults, however, are much more common on the Continent than in England, where the ridges are most commonly straight and level.

English and French Vaults.

The infilling of English vaults usually terminates in a somewhat ragged joint at the ridge, whereas in French vaulting it commonly finishes in a perfectly straight joint, parallel (or nearly so) to the ridge and the courses. The French method occurs sometimes in English vaulting; in Glasgow Cathedral we have numerous examples of it. This ragged joint at the apex of an English vault is weak and unsightly, owing to the great number of small stones used; consequently, in some degree to strengthen and also to conceal it, a ridge rib was introduced. In vaults built after the French fashion there was no structural necessity for such ridge ribs, but in English vaulting they *are* structural, either because they afford an abutment to intermediate ribs (see plan, Fig. 3), or because they give strength to the weak ridge joint.

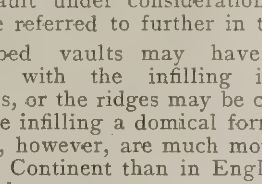


FIG.4.

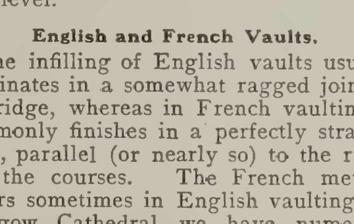


FIG.5.

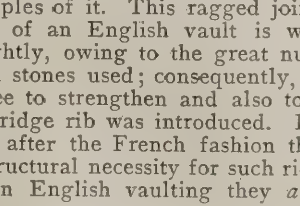


FIG.6.

The infilling courses of an English vault, being straight and flat, were more difficult to build than the domical courses of the French vault, but in England the amount of centering required for the support of the infilling of each cell was greatly lessened by adding pairs of intermediate ribs. These intermediate ribs are each of them half-arches springing from the same abacus as the principal ribs (see plan), and to keep the pair in position previous to the insertion of the infilling, the ridge ribs are essential.

Bosses.

In vaults where intermediate ribs are used, bosses are especially necessary, because of the difficulty in forming true intersections of the mouldings of the oblique ribs with those of the ridge ribs. It may be observed that the use of bosses is not contemporary with the introduction of ridge ribs, but is much older. In early work the intersection of the two diagonal ribs was usually made by one keystone having four arms or stumps (see plan of transverse rib, Fig. 3).

The carving which decorates a boss is usually roughly spherical in form, and in old examples the centre of this carving does not always coincide with the axis of the boss-stone, being placed so as best to conceal the imperfect intersections of the rib mouldings.

Section and Grouping of Ribs of Abacus.

The transverse ribs in early vaults are commonly much thicker than the diagonal ribs, but (as already stated) as it is upon the latter that the main strength of a Gothic vault depends, they should be at least as thick as the transverse ribs. In the aisles of the Lower Church of Glasgow Cathedral the diagonals are 9 ins. deep by 8 ins. thick, while the transverse ribs are $9\frac{1}{4}$ ins. deep by $10\frac{1}{4}$ ins. thick. In later work we find that the ribs are often alike in section (as in the vaults under the transept stairs in the same Cathedral), but the intermediate ribs may with advantage be made thinner and less deep than the other ribs; in the drawings already referred to they are made 1 in. thinner, although the depth is uniform in all the ribs. The wall ribs in this vault are half the thickness of the diagonals, and are built into the wall on the extrados of the window arches, but they may be made much smaller, as they support only one-half of the infilling of a cell.

In early examples the courses of voussoirs were continuous, and rested upon the backs of the ribs (Fig. 4), but in later work the ribs are checked or rebated to support the courses. Greater depth and strength are thus given to the ribs without increasing their projection from the surface of the vaulting.

In the early stage of rib vaulting the Gothic builders avoided as much as possible allowing the ribs to intersect each other at their beginning (Fig. 5), but in later work, due to the greater number of ribs used, it became impossible to accommodate them all on the capital; therefore, the ribs were grouped together at the springing, the springers being built in level courses bonded to the wall.

In the plan, Fig. 3, the springing points of all the ribs stand over an arc of a circle which is concentric with the vaulting shaft, but the apparent general independence of the ribs is rendered more evident in the best examples of Gothic by the way

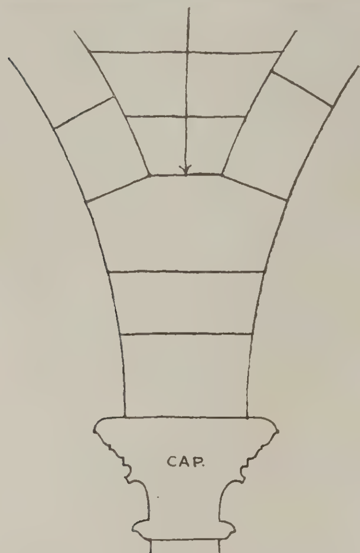


FIG.7.

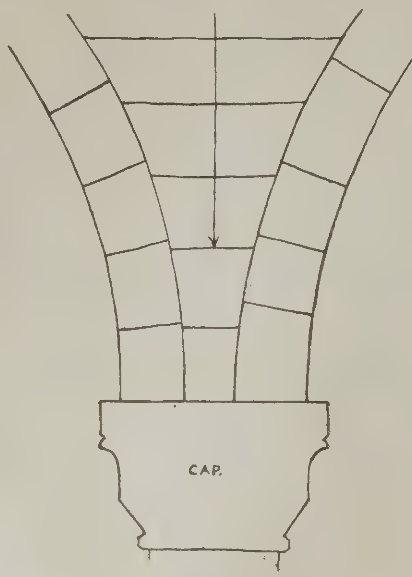


FIG.8.

in which the rib edges are set out on the abacus. This is done by setting the feet of the ribs at varying distances from the centre of the abacus.

The centre lines of the ribs in the plan may or may not be arranged to meet in one point, as in the above-mentioned plan. When close grouping of the ribs is required, the centre lines may meet in a point coinciding with the centre of the shaft, but when wider grouping is wanted (as in a vault without intermediate ribs) this point may be at some distance beyond the centre of the shaft, as in Fig. 6, which is from the Lower Church of Glasgow Cathedral. On the upper surface of the abacus of some of the capitals in this part of the Cathedral, circular lines (shown dotted in the sketch) are actually scribed, which show that the starting point of the ribs was geometrically set out in Gothic days.

The Vault Springers.

The vault ribs of a later Romanesque vault, being independent of each other at the abacus level, have a complete extrados, the joints being normal to the curves. Such vaults have their rib-thrusts very much spread over. In Gothic times the springers of the ribs were not truly arched, as in the earlier work, but are built in horizontal courses, the arched construction beginning where the solid springers terminated. The height to which these corbelled courses are carried varies, but in old work they often reach up to one-half of the vertical height of the vault.

The construction of the springers in solid masonry was an immense advantage, for the following two reasons:—Firstly, the load of the superstructure was transmitted to level-bedded blocks which could not be displaced by vertical pressure (Fig. 7), whereas in the earlier method of construction the superimposed mass was carried on the curved backs of the rib stones (Fig. 8), which might be dislodged; and, secondly, the span of the actual vault rib being greatly lessened, the consequent saving in the cost of centering was considerable.

It is generally understood that in large vault ribs the thrusts are not confined to the springing points, but that there is a tendency for the ribs to rise about the haunches. As a result of this, the haunches have to be strengthened, and the method here employed of constructing them in solid masonry secures concentration of the thrusts upon the walling, the resultant

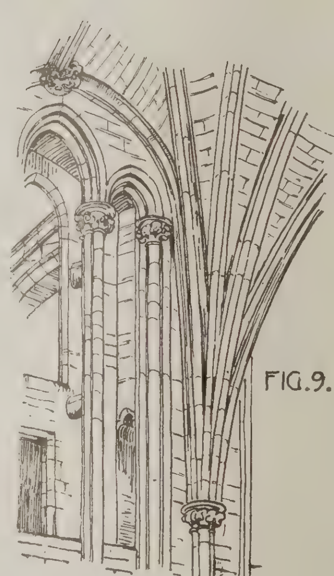


FIG.9.

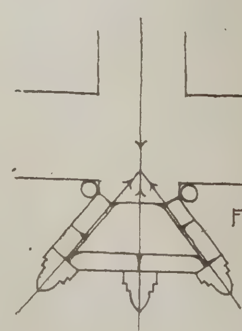


FIG.10.

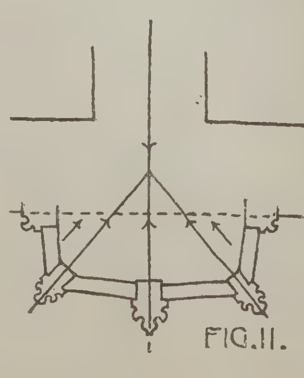


FIG.11.

of these thrusts falling where the flying buttress is placed to counteract it. By raising the springing of the clerestory rib a considerable distance above the springing of the other ribs (Fig. 9), a still better concentration of the thrusts upon the walling is secured (see Fig. 10).

Professor Willis says that "this is a very universal arrangement of clerestory vaults, and is productive of great beauty and convenience."

When the clerestory or wall rib is not stilted, the plan at about two-thirds or one-half the height of the vault is practically a rectangle (Fig. 11), and the thrusts are not so well collected.

Curvature of Ribs.

Each rib, separately considered, being a simple arch, their construction presents no difficulty in stone-cutting; yet the shape and dimensions of the rib-stones could not have been obtained in mediæval days unless the ribs had been drawn down full-size.

A great deal of the effect and character of Gothic vaults depends upon the curvatures of the ribs. The form of the ridge (which may be curved or straight, see Figs. 1 and 3), is among the first things that have to be determined in any proposed vault, because the shape of the ridge fixes the relative altitudes of the apices of the various ribs.

If we assume a rib to consist of one arc of a circle (as was common in early work), the centre for drawing this arc may be placed above, upon, or below the springing level. But the height of the crown of each rib is fixed when the forms of the ridges are settled, and their span is given by the plan; therefore, if the centre has to be on the springing level, the required radius is given by these limitations, but if the centre may be below or above the springing level, any desired radius may be taken for each rib (Fig. 12).

Thus, for the curve of a rib of given height and span we have the choice of many radii when it is permissible for the centre to be placed away from the springing level.

Professor Willis says "the effect upon the general form of the spandrel solid . . . is the principal point to be attended to, and this is best appreciated by considering the form which its middle plan assumes." With level ridges the crown of the vault will be rectangular in plan, but by varying the curvatures of the ribs the horizontal section at half the height, or a little more than half height, may be made to assume any desired form of plan (see Fig. 13).

The following geometrical construction may be employed to give any desired form to the middle plan:—Fig. 13 is part plan of a vault with level ridges, each rib consisting of a single arc of a circle. Begin by drawing the curve of the diagonal rib (D.R.) first, because that having the greatest span is usually the most difficult to deal with, and as this rib so often appears to be semi-circular in old examples

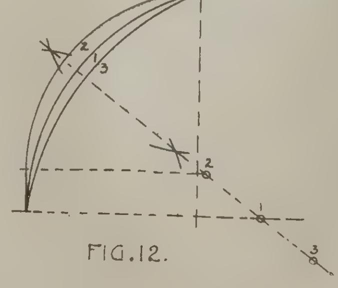


FIG.12.

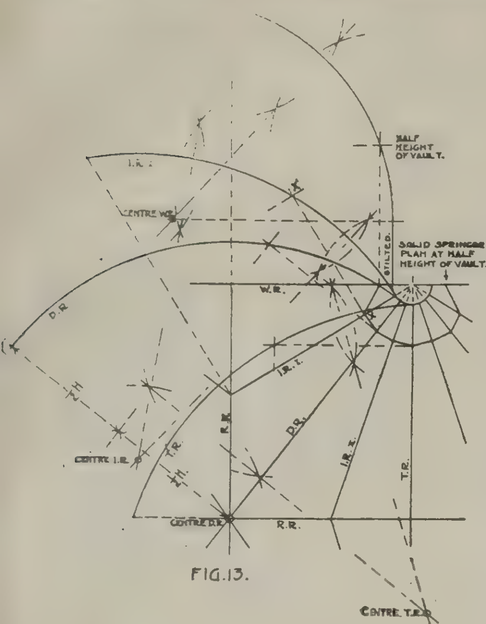


FIG.13.

it may be assumed that its curvature was first settled by Gothic builders. Mark a point on the diagonal rib at about half its vertical height, then project from this point to the plan, and set out the middle plan to the desired form.

Boldness of character may be given to a vault by setting back the vaulting surface where it meets the wall. This is shown in the plan. To find the curvature of any rib, say the intermediate rib (I.R.I.), set up the altitude of the rib at right angles to its plan, and the elevation of the point (X^1) on that rib where it is cut by the middle plan at X. There are now three given points through which the curve of the rib has to pass, and the problem is now a simple one—through three given points to describe an arc of a circle. Notice that the centre is slightly below the springing level. The wall rib is shown stilted, owing to its centre being above the springing level, and the stilting is caused by setting back the surface of the vault at the wall rib.

Wood and Plaster Vaults.

It is not an uncommon method of executing modern Gothic vaulting in wood and plaster to obtain the curves of the ribs by the projection of ordinates, as shown in Fig. 14. Let one of the ribs (the diagonal in this case) be an arc of a circle; the other ribs will be elliptic, and the effect of this is that the entire vault has the appearance of two intersecting cylindrical vaults. This, as is well-known, is the real principle of the Renaissance groined vault, but is entirely opposed to Gothic principles.

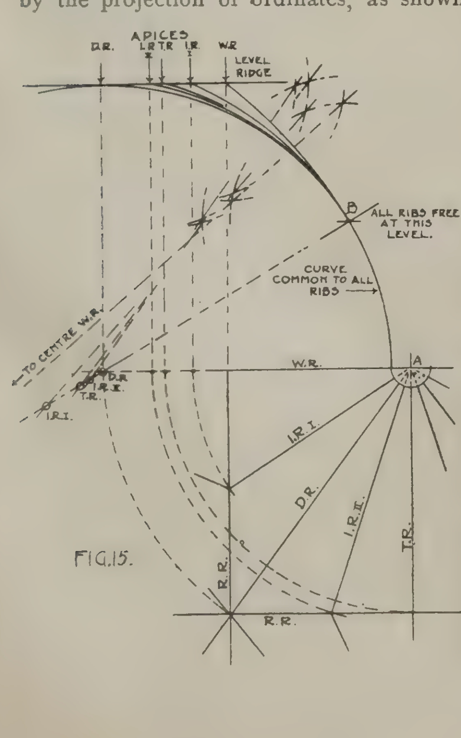


FIG.15.

Single arc ribs have a greater appearance of mutual independence than when the ribs consist of two arcs.

Two-Centered Ribs.

There are two ways in which a two-centred vault rib may have its upper radius adjusted to suit different spans and heights, the lower radius being common to all the ribs. First, in Fig 15, assume the ridge ribs R.R. to be level and the diagonal rib D.R. to be semi-circular. Swing round the lengths of all the ribs on plan to the line W.R. produced, using the point A as a centre. Strike the curve of the diagonal rib and from its apex draw the ridge level. To find the apex of each rib, project up from the points marked on the line W.R. on plan to the ridge line on elevation. Now find on plan the highest point at which the ribs are entirely separate and project this up to cut the curve of the diagonal rib just drawn. In this figure we assume the point B as that at which all the ribs are free, but the proper method of finding this point is shown in the drawing, Fig. 3, and is determined as follows:—Draw the soffit curve of the diagonal rib, and concentric with it the soffit of the infilling. Project from the point of separation on plan to cut the soffit curve of the infilling at Z, and draw from this point a line passing through the centre of the rib curve at *u* The point X on the profile of the diagonal rib gives the height at which the two soffit curves meet on all the other ribs, except the wall rib, which in this case is a single arc rib like the diagonal.

Referring now to Fig. 15, draw a line from B passing through the centre of the diagonal at D.R., and all the centres required for the upper curves of the other ribs will be upon this line.

To draw the upper curve of any of the other ribs, bisect the space between the apex of the rib and the point B, and produce this bisector to cut the line drawn from B through D.R., and the required centre of the curve will be obtained.

In this example, and also in that shown by Figs. 1, 2 and 3 (see centre plate), all the ribs not only have the same curvature at the solid springer, but the change is made at the same height in all. This arrangement greatly simplifies the working of the springer stones, as the mould for the soffit curve and the bevel for the first radiating bed are the same for each rib.

Second method.—If it is required that the upper curves be drawn alike with the same radius, and the springers also drawn with one radius as before, the following construction may be employed:—Fig. 16 gives the plan and heights of the ribs in a quarter of a vault. Select a point A as centre for the springer curves of all the ribs. Then determine the point B at which the ribs are all free and draw the line BA. Find X, the apex of the diagonal rib (the heights H being in this example less than half the span of the diagonal) and bisect the space XB. Produce the bisector to cut BA produced in the point C, and CB will be the radius for the upper curves of the diagonal and all the other ribs. The centre for the curve of

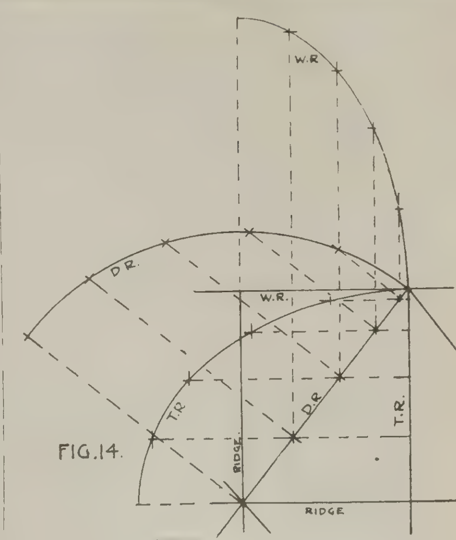


FIG.14.

the upper part of the transverse rib T.T. is found by drawing an arc from A, with radius AC, and describing another arc from centre Y, with radius B C, to intersect the smaller arc in the point E, which is the centre required. Now draw a line through centres E and A and produce it to cut the lower curve in D. Then an arc drawn from D to Y, with radius D E, gives the required curve. The other ribs would be drawn similarly.

Note that the curvatures do not change at the same height in the various ribs in this example.

Curvature of Ribs in Old Examples.

From the measurements of various vault ribs in Glasgow Cathedral, the author has found that in the aisles of the Lower Church (about 1245) the radii of the ribs all differ, and their centres are above and below the springing level. The diagonal rib is a segment of a circle—radius 7ft. 11½ins., centre 9ins. below abacus level. The transverse rib is also a segment of a circle—radius 7ft. 1in., centre 1½ins. above abacus level. The wall rib has a radius of 9ft. 9ins., with centre 1in. below abacus level.

In the later vaulting of the Blackader crypt the curves vary greatly, and in the vaulting over the stairs leading to the Lower Church (1484-1508) all the ribs are

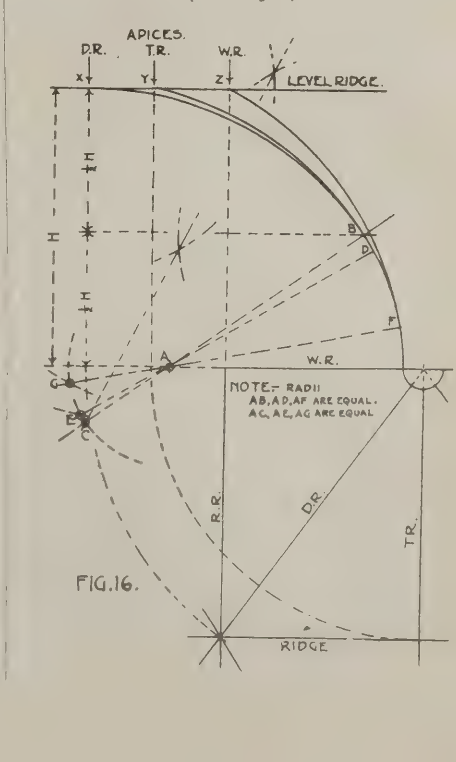


FIG.16.

two-centred, with the centre of the lower curves much below the springing level.

It may be mentioned at this point that the diagonal ribs of the Blackader crypt already spoken of are very much distorted, both in profile and in plan. These diagonals do not run in straight lines, but are wavy in plan, and the author's impression is that this distortion is caused by the inferior manner in which the springers are constructed. The springer stones are not level bedded, but have irregular sloping beds which are not even normal to the curve of the ribs. Fig. 17 shows

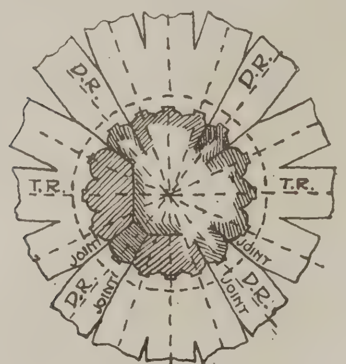


FIG. 17.

a plan of the jointing of the bottom course of the springers over one of the central piers, showing how the diagonals are each set into the springer in comparatively very small pieces, a defect which would very readily produce the crippled appearance noticeable in most of the diagonal ribs there.

The vault ribs in early work consist of a great number of comparatively small voussoirs, while in later examples longer stones and fewer of them were used. The radiating beds of these rib-stones have grooves sunk in them into which cement grout or molten lead is poured to form a joggle. Old fragments show that lead, and also pebbles, have been used for this purpose.

The face moulds required in the working of the rib-stones are obtained from the full-size drawing of the rib curves set out as shown in the drawing, Fig. 3.

(To be concluded.)

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
June 6	SECONDARY DAY SCHOOL, SHREWSBURY (70 Boys and 70 Girls).—Conditions from W. H. Pendlebury, Secretary, Higher Education Committee, Shire Hall, Shrewsbury.
July 13	EXTENSIONS TO WORKHOUSE BUILDINGS, DUDLEY.—Limited to architects practising within 35 miles of Dudley. Conditions from G. W. Coster, Clerk, Union Offices, St. James's Road, Dudley.
Aug. 1	COUNTY HOSPITAL, GUERNSEY.—Conditions from Thomas Robin, President of Directors of Hospital, St. Peter Port, Guernsey.
Aug. 31	PARISH CHURCH AT BISHOPSWEARMOUTH.—Limited to Sunderland architects. Conditions from H. E. Hinckley, 68, Cleveland Road, Sunderland. Deposit one guinea.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Summary of particulars on this page. Conditions from the Secrétariat de l'Association du Monument de la Réformation, 56, Rue du Stand, Geneva.
No date.	COUNCIL SCHOOLS AT NANTWICH.—Particulars from C. E. Speakman, Clerk, Education Offices, Crewe.
No date.	SITE PLAN FOR COTTAGE EXHIBITION, SWANSEA, 1909.—Gold, silver and bronze medals, with prizes of £25, £15 and £10. Particulars from Henry R. Aldridge, 7, Gower Street, Swansea.

Notes on Competitions.

Islington Workhouse Extension.

For the proposed new vagrant wards and additional receiving-ward accommodation, etc., at the Islington Workhouse, St. John's Road, seven designs have been received. These will be assessed by an architect to be nominated by the president of the R.I.B.A.

Another Cottage Exhibition.

Still another cottage exhibition is to be held, at Swansea next year, and in connection with it a site planning competition is announced. The awards will be gold, silver and bronze medals, with prizes of £25, £15 and £10. The site comprises 50 acres, on which the cottages are to be disposed in the proportion of twelve to the acre. There will be three classes of cottages, to cost £175, £200 and £225 respectively. Particulars can be obtained from the secretary of the exhibition, Mr. Henry R. Aldridge, 7, Gower Street, Swansea.

The Gardens of the Peace Palace.

Some time ago three garden architects—an Englishman, a Dutchman and a German—were invited to submit designs for the lay-out of the gardens around the Palace of Peace, in course of erection at the Hague. In this competition the Englishman—Mr. Thomas H. Mawson—has been successful, his scheme, with certain modifications, having been selected. The approximate cost of the work is £25,000.

Geneva Memorial Competition.

The character of the Reformation Monument for Geneva seems to have been very clearly conceived by the Association that has charge of the arrangements. This Association was formed at Geneva in 1906, with the object of organising the celebration of the four-hundredth anniversary of Calvin, and it has decided to erect a monument planned on broad historical lines. In inviting artists to take part in a competition for designs, the Association state that the monument should be historical, popular, and international. The figures represented should be historically accurate, and the figure of Calvin should, of course, be among them; but he is to be surrounded by his most influential fellow-workers and followers, Genevan and foreign. The statues of Farel, Calvin, Knox, and Berga must be so grouped as to make that of Calvin conspicuous. Besides the Reformers, statesmen and soldiers of note in the history of the Reformation throughout the world are to be shown, and must include Coligny, William the Silent, Oliver Cromwell, one or two of the founders of the colonies in New England, and Frederick William of Bradenburg, the Great Elector. Any bas-reliefs that are introduced must be confined to subjects chosen from the history of the sixteenth and seventeenth centuries, and the committee express a predilection for the following historical incidents: The preaching of the Reformed Faith in Geneva; John Knox preaching before Mary Stuart; Henry IV. signing the Edict of Nantes; the departure from Europe or arrival in America of the *Mayflower* with the first settlers of New England; the presentation of the Declaration of Rights to William of Orange and Mary; and the welcome given by the Elector of Bradenburg to the victims of the Revocation of the Edict of Nantes. The site of the monument is to be that section of the Promenade des Bastions which lies between the main avenue and the Rue de la Croix-Rouge. The competition (of which particulars and conditions may be seen in the library of the Royal Institute of British Architects, and may be obtained on application to the Secrétariat de l'Association du Monument de la Réformation, 56, Rue du Stand, Geneva, Switzerland) is to be assessed by an international jury of nine members; the British representative being Mr. George J. Frampton, R.A. The sum of 30,000 francs will be awarded, in any manner the jury may see fit, among the competitors whose designs are adjudged to be best. The competition closes on September 15th.

YORKSHIRE FEDERATION OF BUILDING TRADE EMPLOYERS.

The monthly meeting of the executive council of the above Federation was held at Halifax on May 21st. Mr. J. Biggin (president) was in the chair, and was supported by 48 delegates from local associations.

The Insurance Scheme.

A report on the working of the insurance scheme for the past year was presented, and the recommendation of the Finance and Emergency Committee on the proposals submitted by insurance companies for next year was carefully considered. The report enumerated the special features of the scheme. The policy is without restrictive conditions, and is incomparably superior to any other issued at anything like the rates. The policies of other offices are usually hedged round with many conditions, and repudiation of claims have occurred in several cases. The cover given is absolute, as every legal claim is accepted. Such questions as height of buildings, machinery on job, wood-working risks, sub-contractors, etc., have been fully provided for. Every legal claim has been fully met, and wages paid by employers have been refunded by first post after statement is received. The fatal cases have been satisfactorily concluded, the permanent injury cases have been settled by commutation, and every claim where the workman has resumed duties has been discharged. This is a most valuable safeguard, as several members of the Federation are to-day paying for cases of permanent injury, the company they insured with having been wound up on account of not being able to meet its liabilities. Cases of minor character and of partial disablement have occurred, while only seventeen accidents have been reported of a temporary nature, not necessitating absence beyond fourteen days. Members are reminded that it is in their own interests to secure the return of any injured employee to work, and to avoid payment of compensation beyond a reasonable and equitable amount. Members are also warned against employing workmen who have lost the use of an eye or limb, or whose age or physical infirmity renders them less active, and increases the liability to accident, with the incident expense and probable permanent injury. The amounts of brokerage received have been of the greatest assistance to local associations and the Federation, and the result will be increased in the proportion in which other members loyally co-operate in the scheme. The proposals for next year have received the careful consideration of the Executive Council, and they unanimously recommend, in view of the loss sustained dur-

ing the past year, that the present arrangement be continued for another year, and earnestly appeal for the undivided support of all members of Federated Associations.

On the motion of Mr. J. Lindley, seconded by Mr. A. W. Sinclair, the report of the committee was approved, and it was decided to forward a copy to each association and representative.

On the motion of Mr. A. W. Sinclair, seconded by Mr. H. Fallas, the Federation decided to accept the proposals submitted by Lloyd's, and to adopt them as the official office for the present year.

Form of Contract.

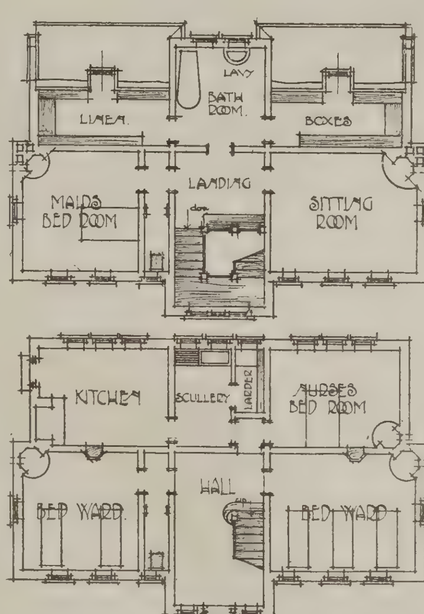
Attention was drawn to the fact that a committee of the Royal Institute of British Architects had been revising the approved form of contract. It was resolved to request the administrative committee to consider the expediency of making representations to, or being associated with, the Institute in connection with the matter, and to place before them the points of difficulty which have been experienced by builders in connection therewith, with a view to such amendment, alteration, or additions as may be considered necessary or expedient.

The local associations were requested to inform the Federation on any points to which they think attention should be drawn.

Operatives' Representation on Conciliation Boards.

Attention was directed to the efforts of the operatives' representatives on conciliation boards to obtain the recognition of an operative society's area as the area in which the conciliation and working rules apply. The different societies' areas vary very considerably, and are, therefore, unsuitable for the purpose named. After discussion a resolution was adopted reminding local associations of the urgent necessity of defining the area in which the working and conciliation rules apply; and that these be restricted to the area which the employers' organisation covers, and in which the standard rate of wages and recognised conditions of labour are operative.

It was reported that a copy of the revised rules of the National Federation had been forwarded to each local secre-



This nursing home is designed to accommodate five beds. The accepted tender for the main building was £750. The outbuildings at the rear comprise washhouse, storage for two bath chairs, coals and wood. The architect was Mr. S. Stallard, of 8, New Road, Oxford.

tary and representative, and that further copies could be obtained on application to the Federation secretary.

The Dewsbury Association requested the Federation to use their influence with architects in order that an intimation may be sent within a reasonable time to unsuccessful contractors. Mr. Townsley and the Federation secretary were requested to draft a suitable letter to be sent to architects, for consideration by the Federation at the next meeting.

Charge for Quantities and Tender Form.

Mr. J. S. Myers drew attention to a proposal that the Leeds Corporation should in future make a small charge—which would not be returned—for each copy of quantities and tender form issued, instead of depositing a certain sum which is returnable when a proper tender has been submitted. The Association had taken steps to oppose the suggestion, which, it was submitted, was absolutely without precedent, and contrary to the principles and customs of the trade.

A letter was read stating that the Sheffield Association was arranging for a visit to Antwerp and Brussels during the first week in August. The secretary of the Brussels M.B.A. has advised all the federated associations in Belgium of the visit, and it was anticipated that the same would be most instructive and enjoyable.

Mr. W. E. Biscomb, on behalf of the York Association, invited the Federation to hold the next meeting in that town. This was agreed to, the date fixed being June 18th.

After the meeting the members visited the works of Messrs. Brookes, Ltd., between Lightcliffe and Brighouse.

Views and Reviews.

Kidder's "Pocket Book."

A volume that is about 7ins. by 4ins. by 2ins. thick, comprising some 1,700 pages, and weighing rather more than 2 lbs. avoirdupois, is rather a gargantuan sort of pocket-book. The author, however—who, we regret to note, is no longer living—was hardly responsible for the misnomer. The book is now in its fifteenth edition, and has grown with every revision, until it has been enlarged to thrice its original bulk. It contains every item of information that the American builder can reasonably expect to find within the covers of a single volume of pocket-book character. It is, in fact, a very comprehensive collection of data and formulæ; but it includes, also, a great deal of miscellaneous matter—such, for instance, as "Height of some of the Tallest Buildings in the United States," "The Longest Bridges in the World," and so forth—that, while interesting enough in its way, is not of conspicuously practical value, and might with advantage be eliminated. Even where the character of the matter is incontestably legitimate, the treatment is sometimes too elaborate and diffuse, as though the compiler aimed at producing an encyclopædia rather than a pocket-book. In justification of the method, however, the publishers may possibly point to the extraordinary demand for the book. They can certainly claim, with considerable show of reason,

that the compiler must have gauged very accurately the requirements of the case as regards America, since 35,000 copies of the "pocket-book" have been called for since its first appearance in 1884.

"The Architect's and Builder's Pocket-Book." A Handbook for Architects, Structural Engineers, Builders and Draughtsmen. By Frank E. Kidder; C.E., Ph.D. Fifteenth edition, revised. New York: John Wiley and Sons. London: Chapman and Hall, Ltd.; price 21s. net.

"Farm Buildings."

Mr. Thomas Winder, having had five and-thirty years' experience in the designing and reconstruction of homesteads, has summarised, in this very useful handbook, a great deal of practical information that, he hopes, may prove serviceable to architects, surveyors, and land-agents. The earliest English homesteads, he remarks, were built of wood, and one building housed the farmer, his family, and his stock. Buildings of this class are still to be found in some parts of England; and it is still sometimes difficult to convince farmers of the wisdom of the dictates of modern sanitary science. This handbook is particularly useful in fortifying the architect with practical reasons for the steps he may have to recommend, possibly, in some cases, in face of prejudice and opposition. It will also make him conversant with many details that anyone who has not specialised on this kind of work might easily overlook. Among the many illustrations, there are some that are of mildly historical interest, as showing quaint old methods of construction.

"Handbook of Farm Buildings, Ponds, etc., and their Appurtenances." By Thomas Winder, A.M.Inst.C.E., Surveyor to the Duke of Norfolk's Yorkshire and Derbyshire Estates, etc. With a chapter on "The Application of Electricity to Farming and Agriculture," by I. W. Beauchamp, Deputy Manager of the Sheffield Corporation Electric Supply Department. London and Glasgow: The Country Gentlemen's Association, Ltd.; price 6s. 6d. net.

"Decoration" of Materials.

This collection of recipes may possibly be of use to the painter and decorator, since it includes various methods of staining, gilding, polishing or otherwise treating decoratively, the materials with which he is most usually called upon to deal; but its contents are of so miscellaneous a character, that it may be more safely commended to the attention of the handy man or the manufacturer of "fancy goods." The word "Decoration" in the title is perhaps somewhat misleading, as there is not the slightest attempt to deal with the æsthetic side of the subject; though we admit it would be difficult to suggest a more appropriate word.

"Decoration of Metal, Wood, Glass, etc." Edited by H. C Standage, Consulting Chemist. New York: John Wiley and Sons. London: Chapman and Hall, Ltd.; price 8s. 6d. net.

The "W.G. Business Barometers and Graphic Charts," of which specimens have been forwarded to us for notice, consist of sheets of sectional paper, on which squares or oblongs are ruled, to facilitate the marking of any kind of fluctuation, occurring from day to day, from month to month, or from year to year. By means of such a graphic record, the present state of business, or of any other variable quantity, and its current and general tendency, can be seen at a glance. The system will no doubt be appreciated by business firms. Specimens may be had from W. G. Systems, Ltd., Craven House, Kingsway, W.C.

IN PARLIAMENT.

(By our Press Gallery Representative.)

Reinforced Concrete at the National Gallery.

In the House of Commons last week, Sir Frederick Dixon-Hartland asked the First Commissioner of Works if, in view of the Milan disaster, resulting in serious loss of life, from the failure of the reinforced concrete, he intended still going on with the use of a similar system of construction at the National Gallery extensions and other buildings; and whether he would consider the advisability, in the national interest, of causing competitive and comparative tests to be made of the different systems of fire-resisting construction before proceeding further with the work?

Mr. Harcourt, in reply, said: So far as my present information goes about the accident at Milan, there is nothing in it which makes me hesitate to employ the best systems of building in reinforced concrete, both at the National Gallery and elsewhere. Tests of various forms of fire-resisting construction have been made by the British Fire Prevention Committee, and I do not see that any useful purpose will be served by repeating them.

Slates for Government Buildings.

Sir Berkeley Sheffield asked the First Commissioner of Works whether any contract for slates to be used for a Government building had lately been given to a foreign contractor.

Mr. Harcourt replied that the Government did not make direct contracts for slates, which were supplied by the contractor. He was unable to discover that foreign slates were being used by any contractor who was now erecting any building for His Majesty's Office of Works. If they had been so used it was without the knowledge or consent of his department.

Stone for Rosyth.

Mr. McKenna, First Lord of the Admiralty, replying to a question by Mr. Williamson, said he had received a communication regarding the suitability of stone from quarries in Morayshire for harbour works at Rosyth. The practice of the Admiralty was to specify the quality of the stone they required, and firms tendering submitted such samples as they thought fit to comply with the specification. There was, therefore, no list of quarries approved by the Admiralty, but offers of particular stone should be made to the contractors who were likely to tender.

Admiralty Cement Contracts.

Mr. McKenna informed Mr. Courthope that the quantity of cement indicated in the invitations issued to cement manufacturers to tender for the Admiralty cement contracts was approximately 10,400 tons, this being the anticipated requirement for one year for all naval establishment at home and abroad in the Director of Works department. The actual amount ordered would depend on the actual needs during the course of the year, and would not necessarily amount to 10,400 tons. It was undesirable to disclose the names of the competing firms.

Mr. Courthope asked what firms who had usually been invited to tender were this year omitted, and, if a request to be allowed to tender had been refused, upon what grounds was the request refused?

Mr. McKenna, in reply, said there was only one firm of cement manufacturers which the Admiralty considered capable of meeting all their requirements, and which they had invited on previous occasions, but had omitted this year. If the honourable member had the authority of the firm in question for asking for a disclosure of its name he was prepared to give it, as well as the grounds upon which it had been excluded on the present occasion.

Mr. Edward Bradbury is the new president of the Architectural Association of Ireland.

New Bank Premises at Swansea for the Metropolitan Bank of England and Wales have been erected from designs by Mr. F. Adams Smith, F.R.I.B.A., of London.

The New Council Offices for Holborn are nearing completion. Messrs. Warwick and Hall are the architects, and Messrs. John Greenwood, Ltd., are the contractors for the building.

Extensive Additions and Alterations to the Earlsdon Council Schools at Coventry have just been completed from designs by Messrs. G. and I. Steane, architects, of Coventry. The constructional steelwork and reinforced concrete floors have been carried out by Messrs. Homan and Rodgers, of Manchester.

In Connection with the Town Planning Bill, which passed its second reading on May 12th, the Government is pledged to introduce at an early date a Valuation Bill for England and Wales which will have two objects in view—first, to simplify, methodise, and make as far as possible uniform the system of valuation throughout England and Wales—and, next, to provide for a separate valuation of site and buildings.

Small Self-Contained Electric Light Plants.—Two interesting booklets dealing with the "Ideal" self-contained lighting plants for country houses have been sent to us by Messrs. Ideal Plants, Ltd., of Macdonald's Lane, Corporation Street, Manchester, who recently acquired the business of Messrs. R. J. Nicholson and Co. Particulars and illustrations are given of sixteen complete plants, each comprising engine, dynamo, storage battery, and switchboard. Electric light in country houses of all sizes, both large and small, can thus be most conveniently and economically provided.

Insurance.

Subscribers to "The Builders' Journal" are entitled to a Free Insurance for £500. Every subscriber should apply for this, sending a postcard with the name of the newsagent with whom the order has been placed. Subscribers can also obtain a General Accident and Sickness Insurance (the "Lighthouse" policy) at a reduced premium, which includes the Annual Subscription to this Journal. A pamphlet giving full particulars can be obtained free on application.

Free £500 Accident Insurance Coupons have this week been sent to the following:—

R. C. M. (London, E.C.), C. S. P. (Victoria), F. T. (Frimley Green), G. G. F. Teignmouth), D. W. B. (Dundee), T. F. A. (Chelsea), J. E. M. (Wool Exchange), F. H. J. G. (Bridgwater), G. G. (Clacton), H. R. B. (Brentwood), J. J. W. (Abertillery), R. A. H. (Paisley), H. E. F. (Bedford Park), H. J. B. (Edinburgh), E. J. B. (Sutton), W. G. R. (Middlesbrough), W. D. (Streatham), H. E. (London, N.W.), E. G. London, E.C.), J. W. H. (London, S.E.), A. S. (Dunfermline), J. M. J. (Leith), A. S. D. (Kensington), E. E. G. (Luton).

FIRE-RESISTING CONSTRUCTION SECTION.

(MONTHLY.)

The Franco-British Exhibition from the Fire Point of View. It must be admitted that, structurally, the Franco-British Exhibition is an improvement on exhibitions of its class, and that greater care than usual has been taken in the preparation of the buildings which house the exhibits. The fire risk, no doubt, is still a very considerable one, owing to the vast area covered, the number of buildings, the highly-inflammable character of their contents, and the extensive skylight and window areas in the individual buildings. From the fire point of view, too, the mass of temporary electric lighting must also be considered as a risk. But, in the actual carcase of the buildings, non-combustible materials have been used to a very great extent—to a far greater extent, indeed, than in any other exhibition of this kind within our recollection, and we think that all credit is due to the London County Council for the trouble they have taken in the matter of these buildings; the local district surveyor, also, has had a most arduous task to deal with, and the fire brigade authorities have had a vast amount of inspection work to carry on, which is by no means yet completed. In view of these facts, and having regard to the trouble taken, it was certainly regrettable that the primary precaution of having all exit doors in working order was overlooked for the opening day. Nearly every door that we saw then was in an unfinished and unworkable condition, whilst those on the Uxbridge Road entrance were in a particularly unsatisfactory state. It appears that there are two committees of the Council responsible for the safety of this exhibition, namely, the Theatres Committee and the Building Act Committee, but during the Easter vacation certain powers were delegated. Fortunately, however, no accident occurred. The following particulars are as representing the opinion of the Building Act Committee of the London County Council in respect to the construction of the temporary buildings which (according to the intention at the time) it was proposed to entirely remove by the close of 1908:—The committee formally stated that, in the absence of any constructional precautions against fire,

(*a*) All buildings exceeding 125,000 cub. ft., but not 250,000 cub. ft., in extent, should be at least 60 ft. from the nearest building.

(*b*) All buildings exceeding 62,500 cub. ft., but not 125,000 cub. ft., in extent, should be at least 30 ft. from the nearest building.

(*c*) The distance of any building from any other buildings should not be less than the height of such buildings measured from ground to eaves; in the case of a difference in height of the buildings, the greater height to be adopted as the measurement for the distance apart.

Provided that such distances were strictly adhered to, the committee were prepared to consider proposals showing:

(1) All buildings exceeding 62,500 cub. ft., but not 250,000 cub. ft., in extent, to be constructed of materials other than incombustible materials.

(2) All buildings which are framed in wood or other combustible material, and which do not exceed 62,500 cub. ft. in extent, to be covered internally and externally with plaster or other material sufficiently fire-resisting. (Where any such building is shown to be at a distance of not less than 30 ft. from the nearest building, it may be constructed of materials other than incombustible materials.)

The above considerations were subject to:—

(*a*) Proper precautions for the safety of the public using the buildings being provided to the satisfaction of the Theatres Committee of the Council;

(*b*) The construction being sufficient to the satisfaction of the district surveyor;

(*c*) The provision of fire-extinguishing appliances to the satisfaction of the Fire Brigade Committee of the Council; and

(*d*) The buildings and structures being entirely removed within 60 days from the close of the exhibition.

The above gives a summary of policy worthy of notice on the occasion of future exhibitions in London or the provinces.

Amendments of the London Building Act. As anticipated, the amendments of the London Building Act which were embodied in the London County Council General Powers Bill have been practically recommended in committee with but trivial alterations, the fact being that very few of the interests concerned have any idea of the existence even of the matter which is being put forward. The amendments will still, of course, have to pass the House of Lords, and we should not be surprised if the report of the chief officer of the London Fire Brigade to the Fire Brigades Committee were called for, and put into evidence. If this be the case, some amendments may still be anticipated.

Fire Precautions for Drapery Stores. It is interesting to observe that at the same time as the question of cubic extent is being dealt with by the House of Commons, mainly in the interests of our great drapery stores, the same subject has also been before the Prussian Diet. Germany is obviously the home of large drapery stores, housed on a big scale, and it is not surprising, therefore, that there have been a good many drapery store fires in Germany. Amongst others referred to in the debate was one at Rixdorf in 1900, one at Bremen in 1903, and another at Spandau in 1905, and the drapery shop fire at Buda Pesth dealt with in our columns some time ago. The tendency of German legislation seems to be very much in the direction of treating large drapery stores on the same lines as factories or theatres, *i.e.*, giving these stores elaborate and complete staircase exit facilities from the upper floors.

Safety in London Council Schools. The Buildings and Attendance Sub-Committee of the London County Council Education Committee, who have been considering the question of improving the means of exit from schools in order that, in the event of fire or panic, the buildings may be vacated speedily, have come to the conclusion that at each school the external door should be fastened back and kept open during school hours. The bolted portions of certain of the existing doors open inwards, and the committee propose that the bolts shall be removed and that the doors shall be made to open outwards. The cost of this work is estimated at £1,500.

Deposit of Plans Showing Means of Escape. The case of the *London County Council* v. *Spink and Son*, which was heard in the King's Bench Division of the High Court of Justice on May 12th, raised several matters of interest from the fire point of view. It was a case stated by the Tribunal of Appeal upon their overruling a preliminary objection by the appellants, the London County Council. The appellants had contended, by way of preliminary objection, that it was a condition precedent (*a*) to the approval or refusal by them of plans showing the proposed means of escape in case of fire, in accordance with section 7 (1) of the London Building Acts (Amendment) Act, 1905, and (*b*) to the right of appeal given by section 22 (1) of the same Act, that such plans should be deposited in pursuance of section 7 (1) before or at the same time that the building notice (under section 145 of the London Building Act, 1894) was served on the district surveyor; and that inasmuch as the notice in regard to the building in question was served on the district surveyor on June 5th, 1906, and the plans showing the proposed means of escape from fire were not deposited with the appellants till December 28th, 1906, the respondents, having failed to comply with section 7 (1) of the Act of 1905, had not made a deposit of plans within that section, and were not entitled of right to have them approved. The respondents had contended (*inter alia*) that the deposit of plans at the same time as the building notice was served on the district surveyor was not a condition precedent to the approval or refusal by the appellants of the plans, or to the respondents' right of appeal under section 22 (1) of the Act of 1905. The Tribunal of Appeal had decided against the preliminary objection, and held that the appeal to them had been properly brought. The question of law was whether they were right in hearing and determining the respondents' appeal, notwithstanding the preliminary objection taken by the appellants. The Court were of opinion that the requirements of the statute were directory and not conditional, and upheld the decision of the Tribunal of Appeal. Appeal accordingly dismissed.

FIRE TESTS WITH BUILDING MATERIALS.

From time to time we have pointed out the useful series of experiments with building materials that are being conducted with the aid of Government grants in the United States.

These tests, which extend over a wide area, include a certain limited selection of fire tests, which are being undertaken with the co-operation of the National Board of Fire Underwriters and the National Fire Protection Association, who respectively play the rôle in the United States of our Fire Offices Committee and the British Fire Prevention Committee.

Exhaustive reports of a bulky character are being issued by the United States Government. In the meantime, we have a cable before us from the *Times*, which summarises some of the fire tests that have been undertaken for comparative purposes, and which may be deemed as a preliminary for the more serious investigations that are still to follow in "full size" tests.

We reproduce the particulars as given by the *Times*, and in doing so we would note that it is a sign of the increasing interest being taken in fire prevention that a daily contemporary should accord so much space to a matter of this kind.

The Search for a "Fireproof" Material.

The United States Government has been making some interesting tests as to the fire-resisting qualities of various kinds of building materials. For a long time its engineers have maintained that even the modern so-called fireproof structures are not worthy of their name, and that, though their construction facilitates the smothering of fires which originate in them, they would be unable to resist the heat of a large conflagration. They maintain that the fire in Baltimore, which some years ago destroyed a large part of the modern business quarter of that city, and the fire which followed the earthquake at San Francisco prove their point. An attempt, therefore, is being made to find some material which will be absolutely fireproof. Chicago has been the scene of the first series of experiments conducted with the co-operation of the National Board of Fire Underwriters and the National Fire Protection Association. The former company lent its laboratories for the purpose.

The Materials Tested.

Thirty panels of various materials were tested, including concrete building blocks; common, hydraulic-pressed, and sand-lime brick; concrete of gravel, cinder, limestone and granite; glazed and partition terra-cotta tile; sandstone, granite, and marble building stone. In each case these were placed in a sliding panel, which formed one side of the furnace. Gas flames were forced against them by blasts of air in such a way as to obtain a maximum temperature of 1,700 degrees Fahr. within half-an-hour of the beginning of the tests. After two hours the panel was extracted and subjected to a jet of water with a pressure of 50lbs. to the sq. in. In the opinion of the engineers this was a more severe test than could be reached in an ordinary fire, though not, perhaps, in a wind-fanned conflagration. None of the materials passed the ordeal unharmed. For comparative purposes the test was a good one, and without being conclusive it has afforded a number of important data for future investigations.

Brick Most Successful.

The brick panels appear to have withstood the tests better than any other material. Two kinds were tested, one made of a new brick and the other of a brick that had been in an engine foundation for some years. The latter best resisted the heat. Fifty per cent. of the new bricks were split, while 60 to 70 per cent. of the old ones were not damaged. Those at the back of the panel were entirely unaffected.

Hydraulic pressed bricks stood the test better than any other material. No damage was apparent whatever after the firing and before the water was applied, and 70 per cent. of the bricks were found to be intact after the quenching of the flames. There was apparently little difference in the strength of the bricks before and after firing.

Effect of Fire on Stone.

Natural building stones showed the worst behaviour of all the material tested. They were almost completely destroyed. A sandstone panel entirely collapsed soon after the heat was applied.

Fire-resistance of Concrete.

Difficulty was found in determining whether the concrete made from limestone, granite, gravel, or cinders sustained the least damage. The surfaces were all rather badly pitted by the fire and washed away by the stream of water. The test was unfair to cinder concrete, as the sample of cinder was poor, containing a large percentage of unburned coal, which ignited, and left the surface of the concrete much pitted. The granite concrete was, perhaps, the best. The damage in no case extended far into the concrete, probably not more than one and a half inches, and the evidence shows that even at this depth the temperature was comparatively low.

Linen tags which were placed in the hollow concrete blocks when they were moulded emerged from the furnace undamaged. Sometimes, however, these blocks split after being subjected to the fire and water test.

Further experiment will be necessary, however, before anything approaching a satisfactory material can be obtained. As far as the experiments go, they appear to prove the contention of Government experts to the effect that a really fireproof material has yet to be found. To the United States Government, especially, the problem is one of the greatest importance.

Commenting on the above tests, the "American Architect" says:—

"One of the most important and useful lessons taught by these tests would seem to be the effect that the proportion of cement used and also the wetness of the concrete mixture bore to the fireproofing qualities of the concrete. The richer mixtures with the greatest percentage of water, while somewhat pitted and scarred, were, in comparison with the leaner, dryer mixtures, practically uninjured after the tests. With the increasing use of concrete as a building material the study of the mixtures best suited to meet the requirements not only of strength, but also of safety in the event of fire, becomes of timely interest, and various tests such as those noted above afford excellent opportunity for such study. If architects in general would give attention to, and be guided by, the results of comprehensive tests as supplementing the lessons taught by some of the great conflagrations of recent years, the time would not be far distant when really fireproof structures would become the rule rather than the exception, and a fire of large proportions would be an impossibility.

LONDON FIRES.

The anual publication of the London County Council in which the report of the chief officer of the Fire Brigade for 1907 has been submitted is a bulky folio publication of some sixty pages, accompanied by some excellently-drawn maps and tables.

It is satisfactory to observe the decrease in the number of fires during the year 1907, these being 523 fewer than in 1906. It should also be noted that the number of serious fires was only 70, or 2.11 per cent. of the 3,320 fires of the year, which number includes 864 chimney fires.

In the number of lives lost there has also been a decrease during 1907 as against 1906, the number being 93, no fewer than 57 of whom were lost before the fire brigade was called.

The London County Council rightly observe that the satisfactory results attained by the brigade are doubtless due in great measure to the augmentation of the staff, and the facilities for rapid mobilisation; but we think that the last ten years' work in improving the construction and equipment of buildings, and particularly the improved lighting and heating arrangements, must have substantially reduced the number of fires. Such matters are very difficult to determine, but, without question, better construction and better equipment have materially improved the condition of things.

In the list of locations of fires it is most interesting to observe that 28 occurred in buildings under repair, which shows that there is a certain risk when builders—and particularly plumbers—have been called in. Gas fitters at work also caused 13 fires.

Gas escapes	caused	..	95 fires.
Defective electric circuits	,,	..	88 ,,
Defective flues	,,	..	109 ,,
Defects in adjoining flues	,,	..	45 ,,
Stoves improperly set ..	,,	..	50 ,,
Overheated gas stoves ..	,,	..	14 ,,
Defects in hearths	,,	..	4 ,,

All these are points deserving of the attention of the architect and the builder, as the fires in question were obviously due to errors or to neglect in construction.

Regarding the London Building Act Amendments, the chief officer of the Fire Brigade reports as follows:—

"The proposed amendment of the Building Act, whereby it will be permissible to increase considerably the dimensions of warehouses and factories in the metropolis, cannot fail to expose London to the risk of conflagrations such as have not occurred hitherto, no matter how stringent may be the regulations governing the erection of such buildings. It will in time also affect the number and extent of 'serious' fires, which at the present time form only a small percentage of the total. The number in 1907 was 70, and the percentage to the total number of fires (including chimney fires) 1.67."

It would appear from the report that a very considerable amount of work is now being done by the Brigade in the inspection of theatres, music-halls, and other places of entertainment; also in respect of lodging-houses and Government buildings.

The notable London fires during the year 1907 were at 12, Wood Street, City, at Farrand's Wharf, Bermondsey, at 2a, Wiesbaden Road, Stoke Newington, at Barnard's Wharf, Rotherhithe Street, and at 111, Queen Victoria Street.

THE ABOLITION OF WOOD IN BUILDINGS.

By Ernest Flagg.

The following article by the well-known American architect, Mr. Ernest Flagg, is taken from our contemporary "The American Architect." It is a valuable contribution to the subject, and should prove of great interest to our readers.

The difference between the cost of fireproof and non-fireproof constructions has a constant tendency to decrease. On the one hand the cost of wood is increasing with its growing scarcity, and on the other hand new and cheaper methods of fireproofing and new substitutes for wood are being put upon the market. While it must be confessed that these new methods and substances leave much to be desired, yet there is no doubt that progress is being made. I know from experience that it is quite practicable now to build entirely without the use of wood, and I have very little respect for the fireproof qualities of any building where wood is used. I have recently completed an office building and a large warehouse which were built almost without wood; what little was used was covered with metal, so that it cannot burn, and it might just as well have been left out altogether.

There are a number of firms now making metal doors, windows, and trim, and as the demand for fireproof features of this kind increases—as it will—invention will be stimulated, new and more perfect methods will be discovered, and cheaper substances found to take the place of wood: so it seems only a question of time when fireproof buildings will be what the name implies.

There is no question, in my mind, that the time has already come when all buildings too high to be within easy and convenient reach of the Fire Department should be built entirely without the use of wood.

Most of our so-called fireproof buildings should be classed as semi-proof, if, indeed, the word "fireproof" belongs to them at all. In many of our large building of this sort there is an appalling quantity of wood. The buildings are like huge stoves filled with tinder ready for the match.

A Calculation.

In New York these buildings contain all the way from 50,000 to 500,000 sq. ft. of floor space. They have double wooden floors laid on wooden sleepers, to say nothing of the doors, door bucks, window sash and frames, trim, office partitions, etc. I estimate that for each square foot of floor area there are 5 sq. ft. board measure of wood. In a building with 50,000 ft. of floor area there would be 250,000 ft. of timber, and in one of 500,000 ft. of floor area there would be 2,500,000 ft. of timber. Cubed, these quantities are 20,000 cub. ft. and 200,000 cub. ft. respectively. No wonder that such buildings were gutted at the San Francisco and Baltimore fires, and no wonder the Parker Building burned even without the aid of a general conflagration. I have heard all sorts of reasons, but what I think was the true one advanced to account for the latter fire was that, as in most other so-called fireproof buildings, too much wood was used.

We tear down what we call non-fireproof buildings, and build what we call fireproof buildings in their place, and we use in the "fireproof" buildings one hundred times as much inflammable material as was used in the old non-fireproof buildings. Moreover, we place a great part of that inflammable material out of reach of the Fire Department, and where, when it once catches fire, as it is sure to do in a general conflagration, it will scatter firebrands far and near. For in a general fire these tall structures cause terrific draughts, and the fire sweeping through the upper storeys carries destruction for blocks around. I was told that in the Baltimore fire the air currents were so fierce that whole pieces of blazing furniture were seen to fly out of the upper windows of some of these buildings and sail off to spread the flames in other quarters.

Wood in Floors.

More than half of the wood which goes into such buildings is contained in the floors. This can all be eliminated without any hardship whatever, and it ought to be done immediately. There is certainly no excuse for wooden floors in buildings which are styled "fireproof." Cement floors cost considerably less than the double wooden floors, and the sleepers to which they are nailed. These floors, though not as pleasant to walk on as wood, can be covered with linoleum, carpet, or other material, or they can be constructed of oxy-chloride of magnesium, as is being done in the Singer building, and require no covering, being both good-looking and pleasant to walk upon.

Doors and Windows.

With wooden floors abolished, the other chief items of wood are the doors and trim of the rooms. It is becoming quite common now to use metal window frames and sash. The wood doors and trim could also be abolished, but not without a considerable increase in cost. Keene cement mouldings can be made to take the place of trim, and a great deal of the trim can and doubtless will be omitted altogether.

With regard to fireproof doors, I think that doors of other material than iron and steel will be put on the market. I have had a door made of a substance called alignum in use in my house for several years; the only fault I have to find with it is that it is too heavy.

Until the cost of these things is further reduced it will be hard to banish wood altogether. We can, however, and should immediately abolish wood floors; with them will go, as I have said, more than half the wood, and three-quarters of the danger, for what wood is left would be scattered, and though it would doubtless burn in a general conflagration, it would be hard to make much of a fire of it in any other contingency.

So long as there is any wood there will be danger, and we must consider the best way to overcome it. Fire doors, bulkheads, and wire glass are all good in their way, but they are makeshifts, not the genuine article. There is only one sure way to prevent fire, and that is to use materials that won't burn.

FIRE-RESISTING CURTAINS. — Another case of the efficacy of fire-resisting curtains at theatres has to be recorded. This was at the West London Theatre, Church Street, Edgware Road, where, on May 5th, an explosion occurred during the course of a performance. A fire-resisting curtain was in operation, and did good service in allaying a tendency to panic.

Correspondence.

Fire Insurance Surveyors.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—As an insurance surveyor I desire to supplement the reply given in your issue for May 13th in reference to the duties of a surveyor to fire insurance companies.

The primary duty of a fire insurance surveyor is to inspect and report upon "risks" of a hazardous or special nature which the clients of his office desire to insure. The acceptance or declinature of such business and the rates to be charged are based upon his survey, though the official decision upon such matters—assuming that he is a surveyor pure and simple, and not a superior officer (*e.g.*, a branch manager) doing a surveyor's work—rarely rests with him. In many cases this work, in addition to supplying a report, involves the preparation of a plan to elucidate it, and to show at a glance the construction of walls and roofing, communications, and relative positions of sections of the risk and surroundings, not only for their own sake but for re-insurance purposes. That, theoretically, is his work, but in practice he must also be in a position to show the proposers the best lines on which to arrange their insurances—for few of them know—and, if the preparation of a specification is necessary, to do it.

Thus, it will be seen that he must have the theory and practice of fire insurance at his fingers' ends; he must possess a rough and ready knowledge of all sorts and conditions of processes of manufacture, with the fire hazard peculiar to each; he must be able to draw insurance plans, which have technical peculiarities of their own; and he must have a sufficient knowledge of building construction to be able to suggest structural alterations which will reduce the fire hazard, while at the same time being reasonably practicable.

I do not for a moment admit that an architect's or a surveyor's training is essential, or even desirable, for such work. The knowledge of the average architect or surveyor on the subject of fire prevention is unfortunately too often conspicuous by its absence in his plans. My advice to "Insurance," if he is not already in a fire office and wants to be a fire insurance surveyor, is to get into one, assuming, of course, that he possesses not less than a good average amount of common-sense, a retentive memory, and a real love of the work. He must realise that he must crawl before he can walk, and that the novice has a lot to learn before he will be trusted to make important surveys However, let me emphasise the fact that it is insurance knowledge that is wanted first, and architectural knowledge last.

There is no *vade mecum* on the subject, and it will take "Insurance" a wide and varied course of study to master the intricacies of a complex business. The volumes of the journal annually published by the Federation of Insurance Institutes of Great Britain and Ireland, now ten in number, are a goldmine of information, but much invaluable information is also to be gleaned from the journals of the local insurance institutes which are scattered through Great Britain and Ireland.

In conclusion, let me urge "Insurance" to also study electricity and chemistry in their fiery aspect, concurrently with his other duties, and as a guiding course of study let me advise him to go in for the examinations (fire branch) of the Federation of Insurance Institutes, not merely

for the sake of the certificates, but for the concentrated and systematised study which is necessary to obtain them.

Yours truly,

ONE OF THEM.

The London Building Act and Means of Escape.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—The recent fire at a house in Derby Street, Kingsland Road, Dalston, when several persons were burnt to death, and the fire at a house at Barnsbury a few weeks ago, when the occupants of the upper storeys found their retreat cut off (there being no roof escape), and several lives also were lost, clearly show the insufficiency of section 12 of the London Building Act, which stipulates that means of escape in case of fire must be provided in buildings over 30ft. in height, whereas if they are exactly 30ft., or less, no such provision is necessary. It is clear that the intention of section 12 was to protect those whose circumstances compel them to live in houses with a number of other occupants, and whose risk of disaster by fire is consequently increased. It is a most excellent Act as far as it goes, but it does not go far enough—the recent fires have proved beyond argument that the legal assumption that the person living in a house 30ft. in height is safe, whilst another living in one just an inch higher is in danger, is quite wrong.

It cannot be denied that houses let out in tenements have a greater fire risk, and consequent danger to the community, than the ordinary private residence occupied by one family, and as it must be in the best interests of humanity to help those who cannot help themselves, let common sense intervene and legislation be introduced to meet the demands.

I am strongly of opinion that section 12 should include all houses occupied by two or more families which exceed 25ft. in height—this would mean that all three-storey buildings which are let out in rooms or tenements would be legislated for.

My reason for fixing 25ft. is, that it would be difficult to get three storeys in less than 25ft., when the other sections of the Building Act, as well as the Public Health Act dealing with habitable rooms, etc., are taken into consideration. Two-storey houses would of course be excluded, but there is not so much danger in that class of house, because, even if let to several families, it may reasonably be expected that in extreme cases they would all be able to escape through the windows without very serious risk of injury, as the height from the ground would not be great.

I am not an alarmist, but cannot shut my eyes to the statistics prepared by the Fire Brigade and other departments of the London County Council relating to loss of life in buildings not fitted with "means of escape." The matter is, I think, sufficiently serious to justify a request for better protection—more especially when effective and inexpensive means are available.

An escape to the roof is the most effective outlet I can imagine. Once on the roof, safety is assured by passing to an adjoining house, where the fire escape can effect a speedy release.

In this connection I might mention the "Bafeco" patent automatic trap-door fire-escape, which only needs to become better known to be more generally adopted. It comprises a trap-door in conjunction with a ladder, counterpoised, and controlled by two cords. When one cord is pulled, a catch is released, and the trap-door automatically swings open, while at the same time the ladder falls down into position; and, similarly, by pulling another cord, the ladder is raised back into its place, and the trap-door is shut down again. I have fitted several of these fire-escapes in the West End of London, and in each case they have answered admirably.

Yours truly,

PERCY A. COAD.

A FIRE-RESISTING FLOOR.

The accompanying illustration shows a fire-resisting floor in course of construction at a new block of schools for the Newbury Education Committee, from designs by Mr. S. J. L. Vincent, A.M.I.C.E., borough surveyor of Newbury. The floor is reinforced with Johnson's wire lattice in continuous sheets extending from wall to wall over eight intermediate supports. It is an interesting example of modern practice.

MESSRS. RICHARD CRITTALL AND CO., of 197, Wardour Street, are carrying out the whole of the kitchen apparatus, hot-water heating and domestic supply at the Albemarle Club, under the direction of Messrs. Smith and Brewer, architects.

"FACTORY AND WORKSHOP WARMING AND VENTILATION, with special reference to Engineering, Motor and Cycle Works," a lecture delivered to the Coventry Engineering Society by Mr. J. D. Sutcliffe, of Manchester, and now issued as a shilling pamphlet (London and Manchester: Sherratt and Hughes), contains a fair amount of useful information, much of it bearing more or less direct reference to the author's business interest in the subject. There are about forty illustrations.

FLOOR IN COURSE OF CONSTRUCTION AT NEW SCHOOLS, NEWBURY.
(JOHNSON WIRE LATTICE REINFORCEMENT).

AUTOMATIC FIRE EXTINCTION AS APPLIED TO FACTORIES.

By Geo. T. Bullock, A.I.F.E.
Chief Surveyor to the Union Assurance Society.

(*Concluded from page 406, No. 691.*)

Having indicated the sources of supply necessary in an installation, it may here be of interest to enter into some details.

Size of Pipes.

The size of the branch from the street main is determined by the greatest number of sprinklers in any one floor, or corresponding floors of communicating buildings. One pipe having a maximum internal diameter of $1\frac{1}{2}$ ins., or its equivalent sectional area in smaller pipes, can be taken off the supply for domestic or ordinary services. In some towns factories may have two separate mains supplied from independent sources, and, provided that the minimum size of each is according to the rule previously mentioned, they may be considered as a duplicate service, but if found to be insufficient in size they would be deemed as one supply, if the connections from the two mains are, in the aggregate, equivalent in sectional area to the pipe required, and assuming that the capacity of the original supply to the mains is adequate.

Elevated Gravity Tanks and Private Reservoirs.

The capacity of these should be in accordance with the following rule:—

When the sprinklers on any one floor, or on the corresponding floors of buildings communicating otherwise than by fireproof doors or shutters, do not exceed 150 heads, 5,000 gallons; 200 heads, 6,500 gallons; exceeding 200 heads, 7,500 gallons.

In order to get the necessary head of water, an elevated gravity tank is placed so that its base is at least 15 ft. above the highest sprinkler, and an indicator is fitted in a conspicuous position, showing the depth of water therein. The tank in all cases should be covered in, and provision made against freezing. In exposed districts it may be found necessary to utilise artificial heat, a small steam pipe, when available, being of service in this connection.

Pressure Tanks.

In some districts elevated gravity tanks cannot be erected, and many objections have been made to their erection on account of the probable necessity of providing special foundations for their support, the large expense liable to be incurred where the buildings are very lofty, and in some instances on account of the restrictions of the Building Act.

Pressure tanks have therefore been introduced to overcome these objections, and are employed where only one unlimited source of water supply can be provided.

Pumps.

These are usually of the horizontal duplex double-acting plunger type, although any other types are permissible, subject to the output being the same as that required for those of the standard type.

The required capacity is as follows:—

When the sprinklers on any one floor, or on the corresponding floors of buildings communicating otherwise than by fireproof doors or shutters, do not exceed 100 heads, 250 gallons per minute; 200 heads 500 gallons per minute; exceeding 200 heads, 625 gallons per minute. Where

FIG. 28. SECTION OF FACTORY SHOWING ARRANGEMENT OF PIPES, VALVES, AND WATER-SUPPLY OF GRINNELL AUTOMATIC SPRINKLER.

buildings are likely to be extended, or additional premises erected, necessitating the development of the sprinkler system, pumps of a larger capacity than that actually required by rule are strongly recommended.

Spacing of Sprinklers.

As previously mentioned, in factory buildings one sprinkler head is usually fixed to every 100 sq. ft. of floor area.

In buildings of non-fireproof construction, the heads are placed not more than 10 ft. apart, 5 ft. from walls, or partitions carried up to the ceiling, or 4 ft. if the external walls be of wood, or of iron lined with wood, and the deflectors within 12 ins. of the ceiling.

In buildings of fireproof construction the heads are placed not more than 12 ft. apart, 6 ft. from the walls, and the deflectors within 18 ins. of the ceiling, the measurements being taken in the case of open-joisted ceilings from the undersides of the joists, and in the case of fireproof arched construction from the crown of the arch.

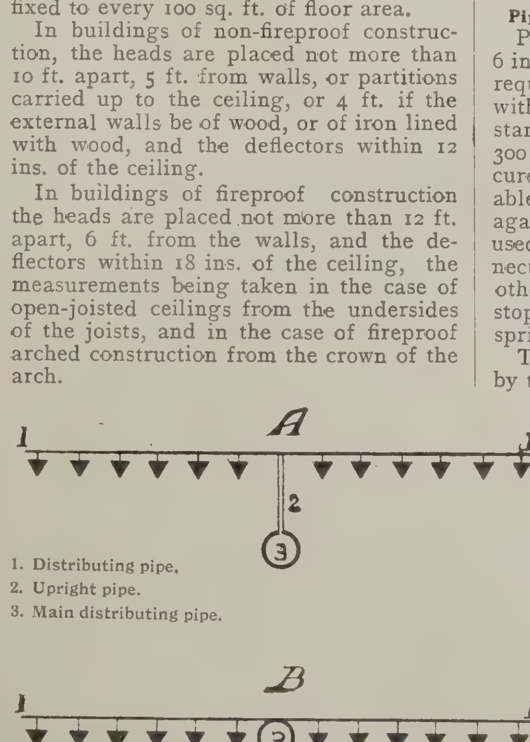


FIG. 29 ARRANGEMENT OF SPRINKLERS.

It is of great importance in spacing the heads in roofs or ceilings divided into bays by joists, beams or arches, and also where transverse beams are used, to so arrange that the whole of each bay is fully and adequately protected, and in some instances, owing to the erection of fittings, racks, machinery, etc., a larger number of sprinklers may be necessary than are actually required by area.

Pipe Areas for Supply and Distribution.

Pipes vary in diameter from ¾ in. to 6 ins., according to the number of "heads" required, and are usually of wrought iron with cast-iron fittings, capable of withstanding a pressure of from 200 lbs. to 300 lbs. per sq. in. They should be securely fixed or suspended, and it is advisable to paint them as a preservative against rust, a distinct colour being also used to prevent the possibility of pipe connection being inadvertently made for any other purpose, as all pipes above the main stop valve must be strictly confined to the sprinkler service only.

The size of an installation is governed by the greatest number of sprinkler heads in any one floor, or series of freely communicating floors every head being included in this calculation, whether under staging, racks, or galleries. The area of the main supply pipe is also governed by the same rule; consequently, an installation having 100 sprinklers on any one floor, or series of floors so described, would require a 4in. main supply pipe; or an installation of over 150 sprinklers on a floor, or floors so described, a 6in. main supply pipe. In very large works or factories having many separate blocks of buildings it may be necessary to arrange for two or more installa-

tions; this would not, however, involve separate sets of water supplies.

The chief point to be considered in arranging the feeds on the various floors is that each section shall obtain its full volume and pressure of water, the distributing pipes being set out so that not more than 12 sprinklers are fed in one row, but where the distributing pipe is taken off a riser connected with the main feed, as in diagram "A" (Fig. 29), 6 heads only must be fixed on either side of the riser, the same rule being also applied when the distributing pipe is taken direct off from the main feed as in diagram "B." The object of this is to be certain that each sprinkler, including those farthest away from the main, is receiving its full supply of water.

Corrosion.

Trouble may be experienced from corrosion of the "heads" due to fumes or vapours arising from or in connection with the work done, or class of goods stored in, a building. In such premises a frequent and careful inspection of the "heads" is necessary, and it will be found advisable to occasionally change the heads, rather than run the risk of a possible failure to act when required. Various methods have been tried to overcome this trouble, but apparently with little success. There is, however, a coating compound known as "Corroproof," which is said to have been successful in generally meeting this difficulty.

Conclusion.

As already indicated, to obtain the best results an installation must be considered in conjunction with other fire-extinguishing appliances of a non-automatic character, such as steam or manual fire engines, fire plugs or hydrants, portable chemical extincteurs, portable hand pumps, buckets or cans.

Intelligent care is necessary in seeing that everything is maintained in thorough working order, by frequent tests, not only of the alarm, but also the gauges, drain and other valves and pump, whilst the running pressure should be occasionally taken, more particularly when the town's main forms one of the supplies.

A number of spare "heads" should also be kept on the premises in case of emergency.

The advantages of a well-equipped system of extinguishing appliances are unquestionable. Too much stress cannot be laid on the importance and advantage of dealing with fire in its incipiency. Official tabulated reports do not appear to be generally kept as to the results of fires in sprinklered buildings in this country; a writer, however, states "that in 1905 there were about 2,200 sprinkler installations in Great Britain, and increasing every year: the number of fires reported in sprinklered risks from their introduction up to that date was 810, of which 737 or 91 per cent. were successfully extinguished by the sprinklers, and of the remainder, 73 or 9 per cent. were classed as 'failures'—54 or 6.7 per cent. being partial failures and 19 or 2.3 per cent. total failures."

Discussion.

In the discussion following the reading of Mr. Bullock's paper some interesting points were raised.

Mr. J. W. Spiller raised the point that according to the rules of the Fire Offices' Committee, it was stated, amongst other provisions, that all openings for ropes, belts or straps must have a sprinkler head so as to command such opening, and asked Mr. Bullock to explain how sprinklers were to be fixed so as to command an opening through a floor for such belts, etc., considering that to catch the heat, sprinklers must be fixed on the ceiling above the opening, where sprinklers were already fixed to protect a room. This at once raised the question as to whether fixing any extra sprinkler over such an opening at the ceiling above would not bring two sprinkler heads too close together, *i.e.*, so close that the water from one head, should it open, would wash the other head and prevent it from opening. In other words, it would appear that the sprinkler heads at the ceiling in the room above would provide adequate protection for an opening in the floor below.

Mr. B. E. Dunbar Kilburn desired to know what arrangements were customary for testing the sprinklers, since their construction would rather lead one to imagine that if left for any length of time they might be liable to fail when occasion arose, though on the other hand, experience might have proved that testing was unnecessary, the sprinklers being safely relied on to come into operation when required. In the event of testing being necessary it would be interesting to know how it was carried out, as obviously it was not possible to allow the sprinklers to come into effective operation, since damage would result.

Mr. Jas. Sheppard said that in order to obtain the full advantage which a standard sprinkler installation was calculated to give, it was essential that the sprinklered building should be planned, constructed, and used in such a manner as to secure the effective separate action of every sprinkler head. Neglect of such precautions was responsible for a considerable number of sprinkler failures. Concealed spaces in partitions, between ceilings and floors in roofs, behind walls, and other finishings, pipe casings, and all similar arrangements, should be avoided. Cupboards and workmen's lockers were serious danger points, and should be formed entirely of expanded metal, or at least have the top constructed of that material. Large undivided floor areas tended to possible failure. Waves of heat from a small fire in a warm factory had distributed themselves along the ceiling, and opened such a large number of sprinkler heads as to render all of them ineffective. This danger might be guarded against by slight screens of incombustible material fixed so as to project about 18 ins. below the ceiling, forming pockets to concentrate heat and prevent its too rapid diffusion, at the same time hastening the opening of sprinklers over the seat of the fire. Such an arrangement might necessitate the provision of a few more sprinkler heads, which would be a further advantage.

Belt or rope races, and vertical shafts for main drives had proved especially dangerous. Such places, in addition to being properly sprinklered, should be securely isolated from the main portion of the building. Stairs and lift wells should be enclosed, and openings through floors should be avoided or specially protected. Spouts or trunks through floors or walls also needed special treatment. The stacking of goods within 2 ft. of the sprinkler heads was very objectionable, and the use of electric power in sprinklered mills necessitated special precautions.

During 1907 there were at least twelve fires in sprinklered cotton mills in Lancashire, resulting in losses of from about £2,000 to £9,000 each. In some instances the sprinklers may have assisted the fire brigades in preventing more serious fires and some of these unsatisfactory fires could not be charged directly to failure of the sprinkler installation, but they all pointed to the necessity for constant, conscientious, and intelligent supervision and maintenance before, during, and after a fire, which it was very difficult to secure. The provision of efficient first-aid fire-extinguishing appliances and fire hydrants was necessary in all cases, in addition to the sprinkler installation. Drenchers operated by the manual opening of a valve for the protection of roofs, windows, and other openings, formed an important branch of a sprinkler equipment, and were necessary in the case of sprinklered buildings exposed to external risks.

Mr. Alex. J. Simpson, referring to the question of cost, cited a factory where the installation had cost £1.8 per sprinkler head; which price included water companies' charges for running a 4in. branch main from the street to the valves—a distance of about 20ft. The installation was of the alternative wet and dry system, and the total area protected was approximately 6,160 sq. ft.

The chairman, in closing the discussion, asked whether any trouble arose from certain kinds of water causing the valves to stick, and whether the Fire Insurance companies took into account the analyses of the waters in considering the usefulness of the sprinklers; and also what was the approximate water consumption per sprinkler under the usual pressure recommended by the manufacturer.

Mr. Geo. T. Bullock, in replying to the discussion, said the question raised by Mr. Spiller with reference to openings for belts, etc., was an interesting one, but he did not think there was so much difficulty in it as appeared at first sight. Each case would require consideration and decision according to circumstances.

Replying to Mr. Dunbar Kilburn, he said it was necessary to frequently test the efficiency of an installation. The alarm valve and gong must be tested weekly, for which a ½ in. test cock was provided. A running test might also be frequently made by opening the 2in. drain pipe, in each case noting the reading of the pressure gauges both before and after testing, when, by a simple calculation (the height of the highest sprinkler being known) it would be easily ascertained whether the required pressure was being obtained. Tests might also be made with the various water supplies separately, and, as indicated in the paper, inspection of the installation as a whole was essential. It was also usual for the insurance companies to make a thorough inspection and test at stated periods.

In reply to the chairman's questions, Mr. Bullock stated that the Fire Offices had to depend on their official tests of the installations to ascertain whether any trouble due to the quality of water available was likely to arise. The approximate water consumption per sprinkler was as follows:—

Pressure at Sprinkler in lbs. per sq. inch, water flowing	2½	5	10	15	20	30	40	50	75	100
Discharge in gallons per minute (approx.)	8½	12	17½	21½	25	30	35	40	50	60

The periodical testing consisted principally of ascertaining that water was available from the various sources at the required pressure, by running it through the 2in. waste pipe, which was drained to a convenient outlet.

A FIREPROOF STORAGE WAREHOUSE.

The household-goods storage warehouse of the Security Storage Co., of Washington, D.C., presents some unique fire-resisting and fire-protection features. The most important of these is the "unit system" of construction, designed to prevent the spread of an interior fire.

In the basement of the building are stock rooms, machinery rooms, etc.; and on the ground floor are three large safe-deposit vaults and the offices of the company, together with examination and packing departments, etc.; while the five upper floors are devoted to storage rooms.

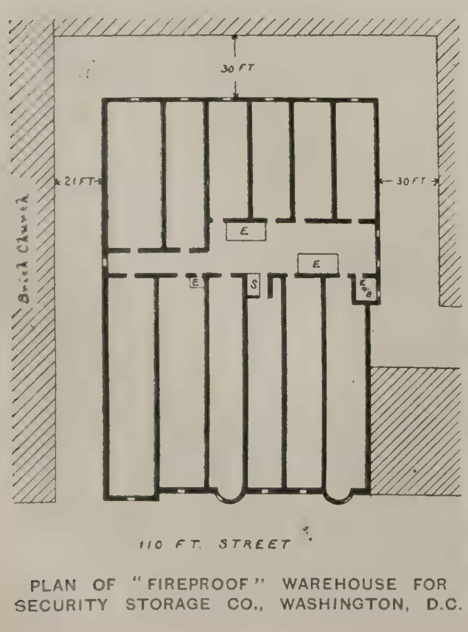
The "unit system" has been applied to this building by erecting it in sections, following the growth of the demand for storage facilities in the community that it serves.

As the initial undertaking, the warehouse company purchased a good-sized plot of ground, and in 1890 erected a single-unit building, having the necessary storage and elevator capacity and entrance-hall space on each floor to provide for the business of the present and near future. With the success of the enterprise, and consequent growth of the business, additional units were erected from time to time, and joined on to the first, each unit having its self-supporting walls and a 30 ft. wide entrance hall, which was made continuous with that of the original structure by knocking down the old wall at that point. This hall narrows to a 10 ft. width in the south end of the building, as shown.

The window and door openings are few. The interior doors are of "Mackite" (plaster-board) and metal-sheathed wood, with a few of iron, and all windows are of iron and heavy wire-glass, with outside iron shutters. The floors and roof are of asphalt, and the elevator wells (E) and stair wells (S) are separated from the storage rooms and hall by a wall of the same thickness as the outer walls—namely, 26 ins.—laid in cement. The party walls between the units are also made of the full thickness of the outer walls. All the interior walls of the building, therefore, constitute effectual barriers to the spread of fire.

The structure of the floor consists of skewback tiles enclosing the steel beams, filled in and covered with concrete, and brick arches between the beams; and above, of cinders in the haunches of the beams, with a 4in. layer of concrete over all, forming the upper surface of the floor. The boiler plant is outside the building. All electric wiring is in steel conduits, open work, throughout.

In case fire should break out, ample means are at hand to extinguish it. A line of 2 in. fire hose is installed on every floor, supplied by a steam pump feeding into a standpipe and roof tanks, and supplemented by chemical extinguishers well distributed through the halls and rooms. The latter are periodically inspected and refilled. There is an effective and reliable electric thermostat equipment, with thermostats set to operate at 125 degs. Fahr. and designed on the "closed-circuit system," so as to sound the alarm automatically, should any defect develop. Finally, the entire building is patrolled by watchmen every hour during the night.



PLAN OF "FIREPROOF" WAREHOUSE FOR SECURITY STORAGE CO., WASHINGTON, D.C.

A CHIMNEY WATER-TANK FOR SPRINKLER INSTALLATION.

The accompanying illustration shows a factory chimney combined with a water tank, forming the secondary source of water-supply for an automatic sprinkler installation for the prevention or spread of fire. In this case, the primary source of supply was from the town water mains. Erected in 1905 at the sawing and moulding mills of Messrs. Henry J. Stewart and Brother, of Shieldhall, Glasgow, the chimney is built of common brick, with Corncockle stone cornice and panel lintels and sills on the base, the tank-corbel being of blue brick, while the chimney cope is of specially-moulded fireclay blocks. From foundation to ground level the height is 16 ft., from ground level to bottom of tank 65 ft., from ground level to top of chimney 121 ft. 6 ins. The effective diameter of the chimney is 5 ft. For convenience of erection the chimney was first built up to the 65 ft. level, the tank then erected, and the chimney afterwards completed. The tank is built of steel plates and angles. Its maximum internal diameter is 18 ft. The cylindrical opening through which the chimney passes is 9 ft. 9 ins. in diameter and 10 ft. 6 ins. high. The tank is covered in, and the top deck (which is provided with a guard railing) is reached from the ground by a permanent wrought-iron ladder passing up the side of the chimney, and through a tubular manhole through the tank itself. The tank is connected to the sprinkler installation by a 6-in. main, fixed to the chimney, close to the ladder, alongside which also run the 1-in. supply to the tank and the ½-in. steam pipe used in winter to prevent freezing in the tank of the supply pipe. The insurance requirements are that the tank shall hold at least 7,500 gallons of water; the tank actually holds more than 8,000 gallons. After being put together for inspection in the yard of the contractors, Messrs. Mechan and Son, Ltd., of Scotstoun, Glasgow, the tank was delivered on to the site with the bottom or conical portion in three sections and the remainder in single plates, ready for erection. Each of the three bottom sections was hoisted into position and bolted to its neighbour, thus making the only bolted joints on the job, the remainder of the tank being riveted up in position. When erected, the tank was painted on the exposed surfaces, while the whole of the interior and the exterior facing to the chimney were coated with "Bitumastic" enamel (supplied by Messrs. Wailes, Dove and Co.). The whole was carried out under the designs, specifications and supervision of Messrs. D. and A. Home Morton, consulting engineers and industrial architects, of Glasgow and Birmingham, the contractors for the builder-work of the chimney being Messrs. James Goldie and Son, of Glasgow.

CHIMNEY AND SPRINKLER TANK AT GLASGOW. D. AND A. HOME MORTON, CONSULTING ENGINEERS.

Law Cases.

BUILDING CONTRACTS: AN IMPORTANT POINT.—In the Manchester County Court, on May 25th, John Edward Rangeley, joiner and builder, of Hyde Road, sued the Gorton branch of the Independent Labour Party for £21, balance of an account for work done and materials supplied. It appeared that defendants had accepted plaintiff's tender to take down a wooden building and re-erect it on another site, the price for the work being £81 10s. When it was discovered that much of the wood was rotten, the defendants told the plaintiff to go on with the work as far as the good timber would permit, and subsequently they agreed to pay for new timber needed, but refused to pay for the cost of working it. As the cost of shaping it would be greater than the cost of the material, the plaintiff could not complete the contract.—Mr. Thomas G. Hartland, architect and surveyor, stated in evidence that it was usual in such contracts for the contractor to undertake to supply necessary new timber. In this case there was no such specification.—For the defence, the Rev. E. B. Ward, rector of

St. Chad's Church, Ladybarn, stated that only the timber in the lower portion of the structure was rotten, and this was so palpable that anybody could have seen it. He thought that the building was not pulled down in a proper way. Portions were left exposed to the weather, and one gable was dragged down bodily by four men pulling at a rope tied over its apex. Then some of the principals were left standing without support for a day or two. Mr. T. R. Day, one of the defendants, a land agent, who was entrusted with supervising the re-erection of the building, said they considered the contract covered both the cost of the timber and the preparation of it.—Mr. T. Cook, architect, asked what was the custom of the trade in a case of this kind where the contract was silent, replied that the contractor would be called upon to supply the new timber necessary, the assumption being that it was provided for in the contract, there being no details whatever to show how the £81 10s. was made up.—Counsel for plaintiff asked, "Do you mean to tell his Honour that if the whole of the timber in this building had been rotten it would have been this man's duty to supply fresh?" and the reply was, "Certainly if he were foolish enough to make a contract upon such terms."—Counsel for the defendants contended that as the contract had been made at a specified price, as it had not been completed, and as the incompleteness was due not to the defendant's prevention but to the plaintiff's unwillingness to proceed, the plaintiff could not succeed.—Judge Parry said the important point was that a contractor was expected in law to exercise common prudence and inform himself of all particulars connected with the work. He must discover, when there were no specifications, what he was expected to do. In this case the defendants had a right to expect that before giving his estimate the plaintiff had discovered how far the timbers were useful for rebuilding, especially as it was obvious that however good the building might be, a certain amount of wastage would result from the pulling down and re-erecting. He therefore found that the cost of the new timber and of working it were covered by the contract. But even if he were wrong in that view, the plaintiff could not succeed in his claim, for it was clearly his duty to protest, complete his contract, and then sue for extras. A little incidental difficulty arising did not entitle a contractor to throw up his contract, though it would be quite different if something wholly new arose, such as the finding of a quicksand. There would consequently be judgment for the defendants, with costs on the claim.—Plaintiff's counsel asked that no order should be made as to the counter-claim for £25 in respect of completing the re-erection, as on the claim the defendants had saved £21 for work done.—In reply, defendant's counsel pointed out that legally the defendants were entitled to be repaid the £25 they had had to pay, but they desired to deal fairly.—The counter-claim was accordingly withdrawn.

ROOF-GLAZING PATENT PROLONGED.—The petition of Mr. H. C. Board, senior member of the firm of Skinner, Board, and Co., horticultural builders and heating engineers, of Bristol, was heard before the Judicial Committee of the Privy Council, Lord Macnaghten presiding. The subject matter of the petition was the prolongation of a patent term in respect of an invention of new or improved appliances for use in glazing or otherwise covering roofs and sloping surfaces.—The patentee claimed that the invention was of great utility, and as applied to greenhouse work had the following advantages as compared with ordinary construction: (1) increased durability and less cost in maintaining the houses in good condition, there being very little, if any, perishable material on the outside of the roof; (2) increased light admitted to the interior of the greenhouse, owing to the absence of wood rafters and sash bars; (3) increased facility in replacing panes of broken glass; (4) additional strength. On behalf of the petitioner it was urged that up to the present time a remuneration commensurate with the merits of the invention had not been received, that the trade had shown a prejudice against adopting the idea, and that great difficulty had been met in placing the invention before the public. It was admitted, however, that royalties to the amount of £2,100 had been received by the petitioner, in addition to the profits received as a member of the firm of Skinner, Board and Co., who had manufactured the patent wire-tension greenhouses. Mr. Bramall, as one of the public, urged that the petitioner's accounts showed that a full and reasonable remuneration had been received, and on that ground he opposed the prolongation of the term.—Mr. Rowlatt, on behalf of the Crown, pointed out that the invention had not a very wide application, and, considering all things, he thought the petitioner had received a substantial sum during the patent term. He could not oppose the question of merit, as, without doubt, there was considerable merit in the invention as applied to greenhouses. It was stated during the hearing that the present application was the last the Judicial Committee would be asked to hear, as under the Patent Act of 1907 the jurisdiction on the question of prolongation of a patent was transferred to the High Court. — Lord Macnaghten, in delivering their lordships' decision, said that the petitioner had received considerable remuneration; but having regard to the merits of the invention, its utility, and the difficulty the patentee must necessarily have found in bringing the invention to the notice of the public, except by exhibit, their lordships would humbly recommend His Majesty to grant a prolongation of the patent for three years.

Enquiries Answered.

Forming a Bowling Green.

HALIFAX. — VILLAGER writes: "What are the special requirements in laying out and forming a bowling green? Would a 6in. layer of ashes and 1ft. of soil and grass be an efficient provision to ensure good drainage?"

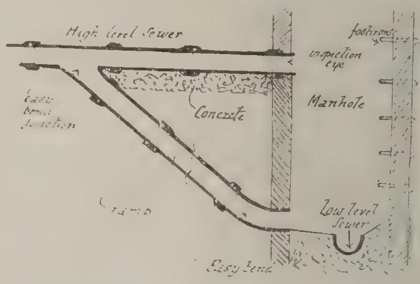
Particulars as to the character of the soil and the situation of the ground are essential before advice can be given. Messrs. James Carter and Co., of High Holborn, state that a very effective way of draining a small lawn is to sink a vertical shaft about 4ft. square in the centre of a level lawn, or at the lowest part of an uneven lawn, with the object of penetrating, if possible, into a porous stratum. This may necessitate excavation to a depth of 10ft. or 15ft. The shaft is then filled with large stones or clinkers, which are built in carefully and firmly, so as to leave as much room as possible for the water. From the shaft to the outskirts of the lawn, four more trenches are cut, 12ins. to 15ins. deep at the extreme end, and about 2ft. 6ins. at the shaft end. In these are laid 3-in. drain-pipes, which are protected with large stones at the shaft end. The work is completed by filling up the trenches and the shaft with porous soil. These particulars are derived from a booklet entitled "The Practical Green-keeper," published by Messrs. Carter, whose advice in such matters is of obvious value.

R.

Connecting Sewers of Different Levels.

INTERESTED writes: "Please show the exact method of constructing a 'drop manhole' on a 9in. stoneware pipe sewer. One sewer runs at a level of 5ft. above the other, being joined obliquely in a manhole."

The simplest method of connecting sewers of different levels is shown in the rough sketch section appended. The



high-level sewer is carried into the top of the manhole at its proper gradient, but before reaching it a ramp pipe is constructed, as shown, with an easy bend junction and an easy bend pipe into the manhole at the low level. The length of the ramp pipe will depend on the depth of the drop. The extension of the high-level pipe into the manhole serves the double purpose of an inspection eye and a pressure relief during storm times.

St. Clement, Cambridge, and Madingley Church.

LEEDS. — A.B. writes: "Please state where it is possible to obtain a rough sketch plan of the churches of St. Clement, Cambridge, and Madingley Church, near Cambridge."

There do not appear to be any published plans of these churches. The only reference to them appears to be that contained in Le Keux's "Memoirs of Cambridge," and some of the Pugin Tours to be seen at the Library of the R.I.B.A. The querist should write in each case to the vicar, who may be able to supply a plan, or state where one is to be found. The addresses will be found in the "Clerical Directory."

H.Y.M.

Skittle-Alleys.

LIVERPOOL writes: "Can you inform me as to the dimensions and details of construction of floors, etc., of skittle-alleys as used in America?"

You will find an article on "Laying down a Skittle-Alley," with plan and sections, on p. 347 of our issue for January 7th, 1903.

"Men Who Build."

LONDON.—X writes: "Have the articles on 'Men who Build' been reprinted? If not, kindly state which architects in the list sent herewith (not reproduced) have been dealt with."

No, the articles have not been republished, and it is not possible for the publisher to supply copies of some of the issues in which they appear, as these are out of print. We have not given an ac-

count of the work of all the architects you name but the following will be found dealt with in our pages: Mr. T. E. Collcutt, February 18th, 1895; Sir Aston Webb, February 26th, 1895; Mr. Ernest George, March 5th, 1895; Mr. Ernest Newton, July 2nd, 1895; Mr. Arnold Mitchell, December 2nd, 1896; Mr. G. H. Fellowes Prynne, May 19th, 1897; Mr. E. Guy Dawber, April 3rd, 1901.

Formulæ for Beams.

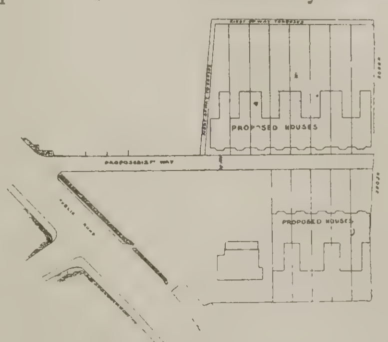
HARROW-ON-THE-HILL. — P. E. C. L. writes: "In Mitchell's 'Advanced Building Construction' (4th edition), on page 147, it is stated that K, the constant for breaking weights, was obtained by centrally loading beams, supported at ends, 12in. long, 1 in. broad and 1 in. deep. On p. 417 of the same book it is shown that K =1-18th of the co-efficient of rupture. Referring to Rivington, vol. iv., p. 52, I find that the method of ascertaining the modulus of rupture, denoted by f_0, is stated to be as follows:—'Small experimental beams, each 1 in. square and 12 in. long between the supports were supported at the ends and loaded in the centre with a weight W.' And, in a footnote, it is stated that the modulus of rupture is always equal to 18 times the weight W that will break the beam across. Kindly explain how it is that $f_0=18K$, since the method employed for obtaining the value of each appears to be the same. Perhaps you would at the same time very kindly give a clear definition of the modulus of rupture."

The following extract from my lectures to teachers at the Royal College of Science will perhaps put this matter in the clearest light. In any question of the strength of a beam we have the following equations:— Effort = Resistance. Bending moment M = Moment of resistance R. And for (say) a distributed load we may amplify the equation thus:— $\frac{Wl}{8}=ZC$, whence we obtain $W=\frac{8\,ZC}{l}$ and $C=\frac{Wl}{8Z}$. It should be noted that W and C must be in the same units (lbs., cwts. or tons), and Z and l must be in the same units, either inches or feet. The modulus of rupture should apparently be the same as the ultimate tensile or compressive strength, whichever is the one that gives way first, or be made up from both of them. It is, however, from some causes which are not clearly understood, generally in excess of the tensile strength, and has to be found by experiment for each material. For this purpose a unit beam is taken 1in. square, resting on supports 1ft. apart. The load in the centre which will just break the beam may be called the co-efficient of transverse strength (c to distinguish it from the modulus of rupture (C). The latter is 18 times the former, or in other words the modulus of rupture is 18 times the central load that will break the unit beam. This must not be misunderstood as 18 times the tensile stress. The 18 is made up as follows:— $\frac{Wl}{4}=ZC$, $\frac{Wl}{4}=\frac{bd^2}{6}C$, $C=\frac{Wl6}{4bd^2}$, but $l=$ 12 in., $bd^2=1\times1\times1=1$, $C=\frac{W\times12\times6}{4\times1}=18W$. C is the same as K of Molesworth, k of Tredgold, and f of other writers. The following comparisons may be noted, $C=f_0$, $\frac{Wl}{4}=ZC$, but $ZC=\frac{bd^2}{6}f_0=\frac{f_0}{6}bd^2=Kbd^2$ $\therefore W=\frac{4Kbd^2}{l}$ (so-called rational formula), and $K=\frac{f_0}{6}$. Also $c=\frac{f_0}{18}$, $W=\frac{4Kbd^2}{l}=\frac{4\times3c\times bd^2}{12L}=\frac{cbd^2}{L}$ (so-called empirical formula). The mean value of C in lbs. may be taken as oak 10,000, teak 12,000, greenheart 16,000, Baltic fir 7,500 but very much depends upon the quality of the specimen. In Harmsworth's "Self-Educator," Part 9, a very complete list will be found giving the maximum and minimum values. The formula generally used by architects for the strength of beams is $W=\frac{cbd^2}{L}$, in this formula W is breaking weight in cwts. in centre, and small c is the central load in cwts. that would break a unit beam, therefore b and d are kept in inches and L is kept in feet. The co-efficient c may be taken as 8 for greenheart, 6 for ash, 5 for oak and teak, 4.5 for beech, 4 for pitch pine, Memel and Dantzic, 3.5 for Riga and spruce fir, 3 for English elm. For fir beams the formula may be simplified to $W=\frac{bd^2}{L}$ where W is the uniformly distributed safe load in cwts. The simplification is brought about from $W=\frac{cbd^2}{L}$ in this way, allow 3.5 for c, multiply by 2 for distributed load and divide by 7 for factor of safety, then $W=\frac{2\times3.5\,bd^2}{7L}=\frac{bd^2}{L}$. Upon the same basis, the safe load in cwts. per foot super. on a floor supported by fir joists, s inches centre to centre, will be $W=\frac{12\,bd^2}{L^2s}$, because the area in square feet supported by each joist will be $L\times\frac{s}{12}$ and the total safe load on the joist divided by the supported area will give the safe load on the floor in cwts. per foot super. thus $W=\frac{bd^2}{L}\div\left(L\times\frac{s}{12}\right)=\frac{bd^2}{L^2s}$.

HENRY ADAMS.

Width of Roadway.

TAUNTON.—ROADWAY writes: "A client desires to build a terrace of houses as shown on the accompanying sketch [here reproduced]. The local surveyor refuses



to pass the plans because we are not forming a 'street' 36ft. wide, but simply a private footway 12ft. wide, for use of the residents only. Can the surveyor compel the formation of a 36ft. roadway? The by-laws are framed from the L.G.B. model by-laws, and have no direct bearing on the subject."

As the proposed street or way is only 12ft. wide, and, after all, is merely a *cul-de-sac*, the district surveyor cannot be considered unreasonable in refusing to accept it in lieu of the 36ft. road required by the by-laws, and I am of opinion that his decision is right and can be maintained. It is just possible that the terrace would have been in accordance with the by-laws had its entrance been from the main road (which you show as "public road"); but it appears to be quite clear that your plan purports to be for the "laying out of a new street" of less than the stipulated width.

F.S.I.

Draughtsman in Office of Works.

DUNDEE.—Z writes: "Please give particulars of Government appointments for draughtsmen to the Board of Works."

Form G.I., post free from the Secretary, Civil Service Commission, Burlington Gardens, W., will give general information as to the subjects in which examinations are held, and the publication of questions previously set.

HENRY ADAMS.

Right of Local Authority to Demand Complete Specification.

NEWPORT MON.—M.S.A. writes: "Plans have been returned from an urban district council on the grounds that the specification sent in with the plans is not of sufficient length. Has the council any right to demand a specification, or, indeed, anything beyond plans and sections?"

If the specification was so curt that it did not sufficiently describe the materials for, and the construction of, the proposed building, there is no doubt the Council can call for a more explicit document. Plans and sections, without a written "description" of the building, are, after all, not of much use. The local by-laws, no doubt, are clear on this point. F.S.I.

Does Lime Affect Dry Rot?

LONDON, S. E. — A. W. S. writes: "Please state whether chalk lime, slaked or unslaked, and used in pugging to floors, is known to be injurious to timber joists; and if so, would Portland cement, used dry, be preferable? I have recently heard of a case in which extensive dry rot in joists was attributed to lime in pugging."

Dry rot in timber is usually set up in consequence of want of ventilation. It is exceedingly likely to occur when the timber is embedded solidly in damp plaster or masonry. Anything that absorbs moisture and confines it in contact with wood is likely to accelerate decay, particularly when heat is present. Pugging a floor with lime plaster thus offers every opportunity for the inception of dry rot, particularly if the boarding is laid before the plaster has thoroughly dried out. If the lime were used unslaked, decay would be invited. There would be no advantage in the use of dry Portland cement, which would furthermore be heavy and expensive. Clean pit sand is sometimes used for pugging, but the best material is probably silicate cotton or slag wool. G.

Architects' and Surveyors' Assistants.

ABERDARE.—SET SQUARE writes: "What are the duties and what is the usual salary of an architect's or surveyor's assistant?"

The duties of architectural assistants vary widely according to the nature and scope of their principals' practice. A junior should be able to trace or ink-in drawings neatly and intelligently, colour drawings and sunprints, put lettering, scales, and other finishing details on plans, etc., and measure and plot simple

surveys. He may in some cases be expected to work out designs from sketches and instructions. The salary given may be anything from 15s. to 40s. per week.—An "architect's and surveyor's assistant" should be able to undertake any duties in connection with the design and supervision of buildings, or the survey of land, for which he may be paid from 30s. to £6 or more, according to his actual duties or attainments. G.

Stress in Suspended Water Main.

CHELTENHAM.—J.O. writes: "A cast-iron water-main, 30ins. in internal diameter, and 1¼ins. thick, is carried across a road underneath, a bridge, unsupported for a length of 16ft. Find, neglecting the weight of the metals, the maximum intensity of tensile stress due to bending. It may be assumed that the pipe is a beam fixed at the ends. Would the same formula apply in the following case?:—An iron beam is of the shape of a hollow cylinder. If the beam is fixed firmly into two walls 30ft. apart, find the greatest uniform load it will bear with safety; safe f. being 9,000."

This is apparently an examination question, as in practice it would be necessary to consider the construction of the joints, and certainly to include the weight of the metal; and the supports would be closer than 16ft. apart. Taking the conditions given, the maximum stress will occur over the supports, being in tension on the upper side. Then we have

Effort = Resistance

Bending Moment = Moment of Resistance

$$\frac{W\,L}{12} = Z\ C$$

W=weight of water in lbs. in 16 ft. length of 30 in. diameter pipe at 62.3 lbs. per cub. ft. $= 2.5^2 \times \cdot 7854 \times 16 \times 62\cdot 3 = 4893$ lbs.

$$Z = \cdot 0982\left(\frac{D^4 - d^4}{D}\right) = \cdot 0982\left(\frac{32\cdot 5^4 - 30^4}{32\cdot 5}\right)$$

$=923.57$. Then $C = \dfrac{W\,L}{12\ Z} = \dfrac{4893 \times 16 \times 12}{12 \times 923\cdot 57}$

$=84\cdot 76$ lbs. per sq. in. maximum stress. The same formula will apply by transposition to the second case, which also appears to be an unpractical examination question. W =

$$\frac{12\ Z C}{L} = \frac{12 \times \cdot 0982\left(\frac{10^4 - 7^4}{10}\right) \times 9000}{30 \times 12} =$$

22386·654 lbs. uniformly distributed.

HENRY ADAMS.

The Church of St. Mary, Plympton.

PLYMOUTH.—S.T.C.C. writes: "Kindly give a short history of the Church of St. Mary, Plympton, South Devon."

The church of St. Mary, Plympton, is a remarkably handsome structure of granite. It was restored (1860) in good taste by the then incumbent and parishioners. The exterior is beautifully tinted with lichens, and displays a profusion of fanciful ornament. The church contains Decorated and Perpendicular portions; the tower, 108ft. high, is of the latter period. The east window, the granite piers, in the nave, and the Strode monuments, dated respectively 1460 and 1637, are particularly worth notice. This church was formerly attached to the great Priory of Plympton, which was founded by Bishop William Warelwast (1107-1137), for Augustinian canons. Of the monastic buildings, the remains are more than is generally supposed. They stand behind the existing church, near the stream of the Tory brook. The undercroft is Norman, with a doorway of which the capitals, side-shafts, and outer porch-moulding are slightly enriched. Above this cellar (which is vaulted in stone) is the refectory, of Early English date, with windows, roof, and fireplace. East of the refectory is the kitchen, a detached building of the 15th century, in a tolerably perfect state. The position of the priory mill is indicated by a modern structure on the site of the former. The orchard which adjoins is stated to be the oldest in England, but the same claim is asserted for the orchard at Buckland Abbey, and the matter is somewhat doubtful. Fragments of the great church and of the cloisters are to be seen built into modern walls and hedges. H.F.M.

Methods of Enlarging Plans.

LONDON, N. W. — WEEKLY READER writes: "Please describe a few reliable methods of enlarging plans."

Probably the only thoroughly accurate way of enlarging plans is to re-plot to the scale desired, from the original survey. Both the pantagraph and the eidograph are fairly reliable, if they are carefully used upon a level table; but on the whole a more satisfactory method of enlargement, quite good enough for everyday use, is by means of squared paper and the proportional compass. Divide the plan to be enlarged into a series of squares by equidistant horizontal and vertical lines, and cover the paper upon which the enlarged plan is to be plotted, with similar squares proportionate in scale to the degree of enlargement desired. Index the intersections by figures in one direction and letters in the other. The compasses are now set in the correct proportion, and the points at which each line of the original plan crosses the sides of the various squares are taken off by the short arms of the compasses, and transferred to the corresponding points of the squared paper with the long arms. The points so marked are joined up until the plan is complete. The construction lines may, of course, be in pencil. G.

Stability of Church Roof Truss.

STOCKPORT.—A.E.M.W. writes: (1) "In reply to 'Plymouth' in THE BUILDERS' JOURNAL for April 8th, it is stated that 'One of these lines of pressure comes outside the section, and so the walls or buttresses, or both, should be strengthened.' Is it meant that the 18in. by 18in. buttress in Fig. 3 is not sufficient? Seeing that the thrust only occurs where buttresses are, and that the pressure line comes within the buttress, is not this sufficient? (2) With respect to Fig. 1, may it be inferred that, taking wind pressure as shown, PR is in tension, and MR in compression; also that PQ is in compression, and LM in tension? (3) Please explain why NO is nil, when it is practically in acute tension. (4) Having found the stresses and strains for a roof, how are we to work out scantlings? Kindly recommend a book on this subject, and also a book on iron roof trusses."

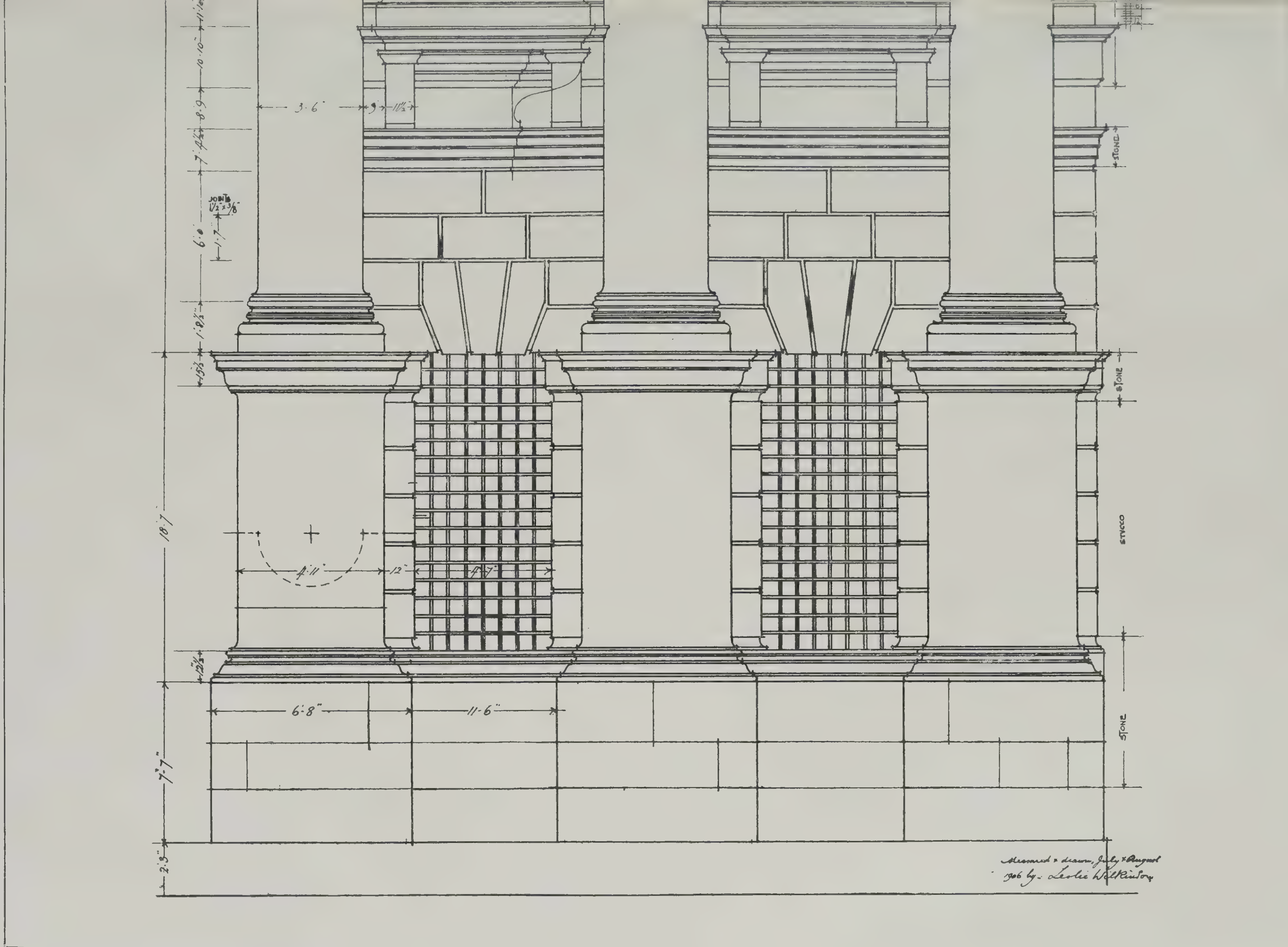
(1) An 18in. by 18in. buttress is not sufficient to fulfil the condition most often imposed as to its stability, viz., that the line of pressure shall fall within the section—*i.e.*, that the wall shall not topple over if there is no adhesion of the mortar. It will be noted that the line of pressure that comes outside the section tends to thrust the wall *inwards*, not outwards; the latter, of course, being generally the case to be considered with buttresses. The result of this would be, however, that with the wind blowing on that side, such side cannot offer half the resistance to the wind that has been assumed in the problem; this will put a heavier pressure on the wall at the other side, and will make the line of pressure tending to thrust the wall out on that side also come outside the section. As stated in the reply of April 8th, the stresses can easily be calculated if any tensile stress in the mortar is allowed, the stability then depending on whether such stresses are within safety. (2) Yes; PR is in tension; MR compression; PQ compression; LM tension. (3) The stress in NO is nil because the bar is unnecessary to the theoretical frame from which the stresses are calculated. It is necessary to remember that the reciprocal figure obtains the stresses which occur in a theoretical frame, which consists of a number of bars pinjointed at their ends, there being no more bars than are necessary to the stability of the frame. In this case NO is a redundant bar, and must be considered absent in getting the reciprocal figure. If it is practically in acute tension, this will alter to some extent the stresses in the other bars; but to find such altered stresses requires a very troublesome analysis. It becomes in tension because it tends to prevent the deformation of the frame. (4) To work out the scantlings when the stresses are known, we have first to know the working stress per square inch that we will adopt. For the tie-bars this working stress is always the same for a given material, but for compression-bars or struts, the working stress depends on the ratio of the length of the strut to its least diameter or least radius of gyration. Suppose the stress in a bar is P and the working stress is F, then the number of square inches necessary in the section is P, P and F being in the same units. From this a suitable section is obtained. There is no book that can be strongly recommended for this type of truss, but the querist will probably obtain useful assistance from Charnock's "Graphic Statics," Vol. 1 (Halden and Co.), Rivington's "Building Construction" (Longmans), and Cassell's "Building Construction." A.

Valuation of House Property—Tastefully Designed Gas-fittings.

BLACKHEATH, S.E.—H.G.B. writes: "(1) Please mention whether there is published any book on the valuation of house property, which explains the method of arriving at the value. (2) Does the rent bear any relation to the purchase price of the house? (3) Great taste is exercised in the design of electric light fittings; is it possible to obtain simple and graceful designs for gas fittings?"

(1) There are hundreds of such books, *e.g.* Curtis's "Valuation of Property," published at "The Field" Office, price 2s.; or Tarbuck's "Handbook of House Property," published by Crosby Lockwood and Son, price 3s. 6d. (2) Certainly the purchase price must be such as will give the investor the rate of interest upon his money which the particular class of property calls for—thus, whilst agricultural land is supposed to yield only about 3 per cent. per annum on its purchase price, house property should certainly produce 5 per cent., and cottage property or inferior buildings of any kind should show a return of 6 or 8 per cent., or perhaps more. The state of repair also has a considerable bearing upon the purchase price. (3) Any of the large gas companies, or any of the large ironmongers, will show a great variety of fittings to suit all tastes—quite as good a selection as for electric work. F.S.I.

THE · ANTICA · POSTA PORTION · OF AN · UN-FINISHED · PALACE AT VICENZA : HALF · INCH · DETAIL · ANDREA PALLADIO ARCHITECT · 1570


STONE
STUCCO
STONE
STONE
18'7"
7'7"
2'3"
6'8"
11'6"
4'11"
12"
4'7"
3'6"
JOINTS 1/2"x3/8"
Measured & drawn, July & August 1906 by Leslie Wilkinson

June 10, 1908. Volume 28, No. 696.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

An Unfortunate Competition.

A somewhat extraordinary state of affairs has arisen at Cardiff in connection with the proposed new intermediate school for boys. Competitive designs were invited for this building, and it was a condition that the cost should not exceed £10,000. Mr. Leonard Stokes was appointed assessor, and, out of the 37 submitted, he placed first a design which was estimated to cost £12,000. Thereupon a considerable outcry arose among competing architects, some of whom had adopted all sorts of economies to keep the cost down to the stipulated sum. Certain adverse comments appear to have been made on the justice of Mr. Stokes's recommendation, but we believe that what he did was perfectly right. It is a fact that none of the designs submitted could be carried out for £10,000, the reason being that the committee asked for more accommodation than could possibly be provided for that outlay. The assessor, therefore, had nothing left but to say to the committee: "Here are the designs; none of them can be carried out for £10,000, and in these circumstances I recommend the one which I consider to be best, and this will cost £12,000." Of course, the trouble has arisen through the committee drawing up their own conditions and then importing the assessor. That must inevitably prove unsatisfactory, if not disastrous, because the average committee has no knowledge of the problem in hand, and consequently conditions are drawn up which are faulty in many particulars. This competition at Cardiff is a case in point. The committee wanted too much for their money. And now the whole competition is to be started afresh, for at last week's meeting of the City Council it was decided that a new competition should be held among the same 37 architects who competed before, and that in this second competition the cost of the school should be advanced to £12,000. We trust the second attempt will not prove a fiasco like the first. But the moral is plain: laymen's conditions are a snare and a delusion.

The Important Matter of Sanitary Fittings.

Many treatises have been written on the homes of the people, and in almost every instance the author has laid down certain requirements for the consideration of the owner, the builder, and the architect; he has touched upon points which tend to improve the general surroundings of dwellings; he has specifically named what articles are considered to be indispensable; but the all-important matters of a pure water reserve supply, combined with protection from contamination of the water-service pipes, and the provision of sound sanitary fittings are dismissed with just a passing word of mention; yet these are vital matters. In the Housing Bill introduced by Mr. John Burns, provision is made for the supervision of fittings, including those at present in use as well as those intended to be fixed, and this is a step in the right direction. Until now no power to select or prohibit the use of a fitting has been vested in the medical officer of health, the engineer or surveyor, or the chief sanitary official; such control (if it can be called so) having been left to the engineers of various water authorities, whose opinions are so widely different from one another that scarcely any two agree as to what is an efficient article. Hitherto, the engineer for almost every water authority has set up a standard of his own, with the result that what would satisfy a city like Manchester would be debarred in Liverpool. As President of the Local Government Board, perhaps Mr. Burns will cause provision to be made in the clauses to establish examination boards in various centres of the country, who shall have power to fix a standard of efficiency, and on their sanctioning a fitting, it shall be binding in other centres. The general public expect that, with the local authority's power to enforce the submission of plans of buildings and of drainage, security is provided against bad fittings. The plans, however, only show the main structure, and no detailed particulars are given as to the internal fittings, which are usually selected by the architect or the surveyor, or, in the absence of either, the selection rests with the property owner or the builder. The officials of the local sanitary authorities have no power to reject the articles selected, which often only *just* comply with the water companies' regulations. The architect is frequently blamed for permitting the use of certain fittings, but in many instances he has no choice; for when the estimates are received it is often demanded that a reduction in the cost must be made, and when this happens, the cost of the sanitary fittings is generally reduced first, then the water and storage fittings, and after that other domestic conveniences. Yet, as already pointed out, this is quite an inversion of things, for the sanitary appliances should receive pre-eminent attention, and only those should be used which have been proved by experience to be serviceable and trustworthy.

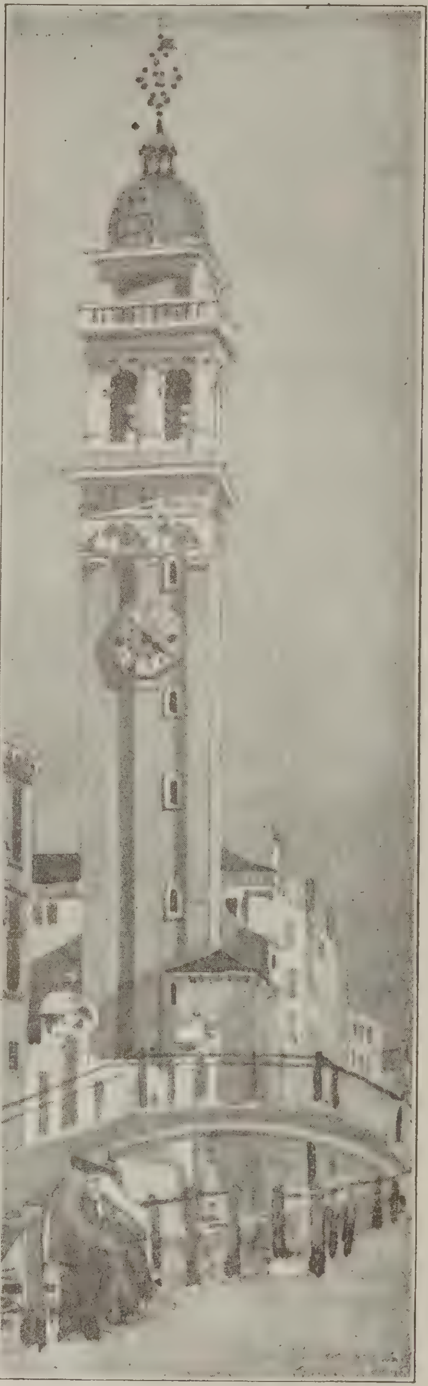
The Architect "Boss."

A writer of obvious Trans-atlantic extraction, spreading his delightful knowledge of architects and architecture in the pages of a monthly magazine, has passed under the critical observation of our esteemed contemporary "The American Architect." As a result, we are provided with an interesting theme. The magazine writer thus: "But the modern architect is slow to learn his limitations. He yearns for supremacy and pants for control. He must, he lays down as his first and last principle, be the Boss. Being boss, he takes everything into his own hands; yet he hardly puts pencil to paper before he finds out he must call in others—men engaged in other occupations and trained in other knowledge." On this score our well-informed contemporary turns to the pages of history. No one doubts that the Grecian architect dominated the entire work—that he "bossed the job," just as his present-day brother does. And if the Grecian architect called in the services of a brother builder to engineer his foundation, we know how stable a base he supplied for the superstructure that crowned it. In the Mediæval Age no doubt the architects, or master builders, were more to the critic's liking, for, if records be true, they did all the work themselves. But what of later years? Does anyone doubt that Michael Angelo or Christopher Wren or Inigo Jones "bossed" the edifices that make their names famous? And what other way leads to a good result? Do we not know, in the relationship between architect and client, that when the client "bosses the job" the result is unsatisfactory? In truth an architect is known by his completed work. If he has "arrived" and can insist upon his ideas being carried out, well and good; but if, for business considerations, he must ensure the goodwill and future favour of his client by conceding that which he does not approve, he then has ceased to dominate the work, and, while he must be its sponsor, he suffers by criticisms of those who, being unfamiliar with the governing conditions, are unqualified to pass judgment on the architect's real ability.

OLD COTTAGES AND FARMHOUSES IN SURREY.

The subject of this book is irresistibly fascinating, and the treatment in text and in illustrations is fully sympathetic. Surrey, which, where it merges in South London, is a synonym for squalor, is, in its rural reaches, one of England's most delectable counties. Its rolling downs, its widespreading solitudes of meadow and common, and its tranquil villages are among the chosen abodes of the spirit of peace. The cottages and farmsteads and inns of the county are, on the whole, quaint and homely, rather than showily picturesque, but many of them are indisputably charming. Mr. Curtis Green, who writes the delightfully discursive introduction to the plates that form the staple of the volume, and who himself supplies a large number of excellent sketches, has doubtless hit upon a fundamental truth when he says (though not in so many words) that the beauty of the old Surrey cottages is derivative and incidental rather than the result of calculated aim and deliberate intention. There is no straining after effect. The buildings seem to have grown out of their surroundings, as the natural outcome of local conditions, ideas, requirements, materials and workmanship. They are racy of the soil, and they have the crowning virtue of purity of style. "Wherever detail does not assist the main object of the building it is excluded, and where it is called for it is appropriate to the material and of good workmanship." The few exceptions to this rule are, he suggests, due to early incursions of foreign workmen. They convey, therefore, a very good moral lesson; but Mr. Green is fain to confess (again implicitly) that, from the professional and æsthetic point of view, the examination of these examples is chiefly valuable negatively, as showing the limitations of such study as a means towards architectural education. "Some of these old buildings," he says, "are works of art—that is, they show that intangible quality, the result of growth and life, which no artificial rules or mechanical means can achieve." Nevertheless, such examples must be in many ways profitable for study. Although the student may seldom or never succeed in surprising the secret of their charm—that subtle "baffling factor" which in each instance defies measurement and eludes analysis—he can perceive and generalise the important principles, and can imbibe the vitalising spirit that underlie and inform all work that is at all worthy of attention. Direct and close imitation of general design or of selected details would of course bring its own nemesis; but subconscious adaptation is probably an inevitable result of the earnest contemplation of impressive examples, and can hardly be otherwise than beneficial. And besides possessing considerable practical value, the book, with its hundred collotype plates by Mr. Galsworthy Davie, who has chosen his subjects with rare taste and feeling, and with the clever sketches and interesting letterpress by Mr. Curtis Green, is certainly a beautiful production, which should find a place on every architect's book-shelf.

"Old Cottages and Farmhouses in Surrey." A series of 128 examples, illustrated on 100 collotype plates from photographs specially taken by W. Galsworthy Davie. With an introduction and numerous sketches by W. Curtis Green, A.R.I.B.A. London: B. T. Batsford, 94, High Holborn. Price 21s. net.



CAMPANILE OF S. GIORGIO DEI GRECI, VENICE, DRAWN BY LESLIE WILKINSON.

This graceful bell tower, erected in 1538 by Jacopo Sansovino, is built of brick and stucco, and stone. The lantern and finial surmounting the lead dome are very similar to those on the domes of St. Mark's. The tower is about 30 ft. square and 135 ft. high, and, like most of the Venetian campanili, stands considerably out of the perpendicular.

CHAIR OF ARCHITECTURE AT BELFAST UNIVERSITY. — The Ulster Society of Architects have passed the following resolution, copies of which are to be sent to the Chief Secretary for Ireland, and to members of the House of Commons Committee on the Irish Universities Bill: — "That any university created for Belfast and the province of Ulster will be incomplete unless provision is made for the establishment of a Chair of Architecture therein, and that it is essential that sufficient funds be provided by the Government to enable the statutory authority of the proposed university to provide such a chair."

VICTOR HUGO ON THE RENAISSANCE.

In a recent issue we referred to Victor Hugo's theory that the decline of architecture set in with the invention of printing—the primal revolution which resulted in the abandonment of the stone letters hitherto expressed by architecture, and the substitution of a new form of recording the thoughts of humanity. To the matter already given, the following summary of the great French writer's concluding remarks may be added:—

"In the days of architecture, long ere the first press was set up, it was depicted by the underlying symbolism, apparent in all structures of a monumental nature, but later the printed book destroyed the building, and thought thus passed from a state of duration to one of immortality. Why, then, should we wonder that the human intellect gave up the architectural alphabet and had recourse to the printed one? Mankind was no longer obliged to translate thoughts into an edifice, to set in motion four or five other arts, much gold, a whole mountain of stone, a forest of timber, a nation of workmen. But from the moment that architecture, by reason of the introduction of printing, became an art like any other art, it ceased to be the sum-total of art—the supreme tyrant art, as it immediately lost the power of holding the other arts, which consequently broke their bonds and went each its own way. Inasmuch as isolation and independence enlarge most things, the subordinate arts gained by this breaking away: carving thus became sculpture, picture-making became painting, the canon became music. The result might be compared to the mighty empire dismembered at the death of Alexander, whose provinces thereupon became kingdoms. Hence arose Raphael, Michael Angelo, Jean Goujon, Palestrina, and other men pre-eminent among the art giants of the sixteenth century. Simultaneously with the arts, thought gained freedom in all directions. The heresiarchs of the Middle Ages had already made large inroads upon Catholicism, and later, religious unity was destroyed. Had it occurred prior to the invention of printing the Reformation itself would have been but a schism: that invention made it a revolution. So, when the sun of the Middle Ages had wholly set, and Gothic genius had for ever faded from the horizon of art, architecture grew dimmer, duller, and fainter. The printed book sucked its life-blood, and destroyed it. It became commonplace and paltry, and ceased to express anything, even the memory of the art of former ages. Reduced to itself, and abandoned by the other arts (because human thought had discarded it), journeymen were called in, owing to lack of artists; plain glass usurped the place of painted windows, and the stone-cutter succeeded the sculptor. Vigour, originality, life, and intellect were at an end, and architecture crawled, like a pitiful beggar of the studios, from copy to copy. That Titan of art, Michael Angelo, had a last inspiration, the inspiration of despair; he piled the Pantheon upon the Parthenon, and thus created St. Peter's at Rome. It is a great work, the last original creation of architecture, the signature of a colossal artist at the foot of the vast registry of stone which it closed. But, with the death of Michael Angelo, what became of this wretched architecture which survived itself in a spectral ghost-like state. It took St. Peter's, at Rome, copied and parodied it. Every century had its St. Peter's; in the

seventeenth century it was the Val-de-Grâce, in the eighteenth Sainte-Geneviève. Every country had its St. Peter's; London had its own; St. Petersburg had its own; Paris had two or three. A worthless legacy, the last unmeaning drivel of a great art grown old, and reduced to dotage before it died!

The Decline of Art and the Rise of Geometry.

"And if, in place of these characteristic monuments, an examination be made of the general aspect of art from the sixteenth to the eighteenth centuries, there is the same appearance of decline and decay. From the time of Francis II. the architectural form of an edifice became less and less apparent, and the geometric form more and more prominent—the beautiful lines of art gave way to the cold and inexorable lines of geometry. A building ceased to be a building, and became a polyhedron. Yet architecture struggled to disguise its nakedness. It gave us the brick houses of the reign of Henry IV., with brick corners, as in the Place Royale and Place Dauphine; the churches of the reign of Louis XIII.—heavy, clumsy, surbased, short and broad, loaded with a dome as with a hump; and the palaces of the reign of Louis XIV.—long barracks, built for courtiers, stiff, cold, and stupid. Lastly it gave us the style of Louis XV., with its chicory and vermicelli, and all the warts and fungi which disfigured that decrepit, toothless, coquettish old architecture. From the days of Francis II. to those of Louis XIV. the evil increased in geometrical ratio. Art was nothing but skin and bones. It was dying a wretched, lingering death.

"Meanwhile, what was printing doing? All the life which architecture lost flushed its veins, and in proportion as architecture degenerated, printing throve and flourished. The capital of forces, which human thought had hitherto expended in building, was henceforth expended in books, and so from the dawn of the sixteenth century onward the press, grown to the level of the declining architecture, battled with it and slew it. In the seventeenth century it was already sufficiently supreme, sufficiently triumphant, sufficiently sure of victory, to give the world the spectacle of a great literary age. In the eighteenth century, after a long interval of rest at the court of Louis XIV., it once more grasped the old sword of Luther, armed Voltaire with it, and hastened tumultuously forth to attack that ancient Europe whose architectural expression it had already destroyed. When the eighteenth century closed, it had uprooted everything. Which of the two arts, Architecture or Printing, has really represented human thought for three centuries past, which translates it, which expresses not only its literary and scholastic fancies, but its vast, profound, universal movement? Printing. Let no one be deceived; architecture is dead, irrevocably dead; killed by the printed book. . . .

"And in the future, should architecture accidentally revive, it will never again be supreme. It must bow to the sway of literature, formerly subject to it. The respective positions of the two arts will be reversed. It is certain that the rare poems to be found during the architectural period are like monuments. In India Vyâsa was as manifold, strange and impenetrable as a pagoda. In Egypt, poetry had, like the buildings, a grandeur and quietness of outline. In ancient Greece, beauty, serenity and calm. In Christian Europe, the Catholic majesty, popular simplicity, the rich and luxuriant vegetation of a period of renewal. The Bible is like the Pyramids, the Iliad like the Parthenon, Homer like Phidias. Dante in the thirteenth century is the last Roman Church; Shakespeare in the sixteenth the last Gothic cathedral."

THE CHURCH OF SANTA MARIA DI LORETO, ROME. DRAWN BY LESLIE WILKINSON.

This church, built of red brick and stone, stands on the north side of the Piazza del Foro Trajano. It was begun by Antonio da Sangallo the younger about 1507. The rich stone lantern crowning the lead-covered dome was added in 1580 by Giov. del Duca. At the side stands the church del Nome di Maria, erected in 1738, the dome of which is seen in the above sketch, which was made from a point of view that has lately become possible by the demolition of a large block of buildings in connection with the vast monument to King Victor Emanuel, now nearing completion.

Obituary.

Mr. L. G. Mouchel.—We very much regret to announce the death of Mr. L. G. Mouchel at Cherbourg on May 27th. He was born in that town in 1852, and received his education as an engineer at the Government School of Mines in France. Subsequently he was engaged in various enterprises in England and on the Continent, until in 1898 he acquired from M. Francois Hennebique the sole agency in the United Kingdom for his system of ferro-concrete construction. Mr. Mouchel was thus the pioneer of reinforced concrete in England. No fewer than 600 ferro-concrete buildings and engineering works have been carried out under his direction. About a year ago, feeling his health failing, he transferred his business to his staff under the name of L. G. Mouchel and Partners, thus shifting a large proportion of his responsibility on to their shoulders. His loss will be keenly felt, for in addition to his qualities as an engineer, he possessed a charming personality which endeared him to a large circle of friends, and he extended a wide generosity and sympathy to charitable institutions at home and abroad. Mr Mouchel was never married, and he had no hobbies. He lived entirely for his work, and the wonderful energy he displayed in the pursuit of it was the means of overcoming many apparently insuperable difficulties in establishing his new system of construction in England.

Sir Robert Reid, the great railway contractor, who died at his home in Montreal on June 3rd, from pneumonia, was a native of Coupar-Angus, Forfarshire. In 1871 he went to America, and there built

up his fame as a railway contractor. He was responsible for many important railways in the United States, Mexico, and Canada, and constructed the heaviest sections of the Canadian Pacific Railway. Two of his greatest triumphs were the international bridge across Niagara and the Lachine bridge over the St. Lawrence at Montreal. He received his knighthood in 1907.

Notes on Competitions.

Secondary Schools, Tiverton.

Mr. C. Harrison Townsend, F.R.I.B.A., has been appointed assessor in this competition.

Council School, Kingsdown, Bristol.

Thirty-three designs were submitted in this competition, and that of Mr. W. S. Skinner, F.R.I.B.A., of Bristol, has been selected by the assessor (Mr. W. L. Bernard, F.R.I.B.A.) and recommended for adoption. The school will accommodate 500 scholars and is estimated to cost £7,389.

National Library Buildings, Aberystwyth.

The council of the National Library of Wales are about to select a limited number of architects to submit designs for the National Library buildings to be erected at Aberystwyth, and they are prepared to receive from such architects designs and photographs of libraries or buildings of a similar character erected under their direction. Particulars can be obtained from Mr. J. E. Davis, hon. secretary, National Library of Wales, Aberystwyth.

Plans of Farm Buildings.

The awards in the competition for plans of farm buildings instituted by the Royal Agricultural Society of England are as follows: 1st (£50), Mr. J. W. Hepton, Market Weighton, Yorks; 2nd (£25), Messrs. Clark and Moscrop, Darlington; 3rd (£15), Messrs. Samuel Taylor and Son, Nottingham; 4th (£10), Mr. J. M. Holmes, Grimsby; highly commended, Messrs. P. Bonsor and Son, Cambridge; commended, Mr. H. Bragg, South Norwood, and Mr. H. Burr, Letchworth. The designs of the successful competitors will be exhibited at the Newcastle show.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
July 13	EXTENSIONS TO WORKHOUSE BUILDINGS, DUDLEY.—Limited to architects practising within 35 miles of Dudley. Conditions from G. W. Coster, Clerk, Union Offices, St. James's Road, Dudley.
July 31	ELEMENTARY SCHOOL AT BANBURY.—Conditions from Oliver J. Stockton, Town Clerk, Banbury. Deposit £1
Aug. 1	COUNTY HOSPITAL, GUERNSEY.—Conditions from Thomas Robin, President of Directors of Hospital, St. Peter Port, Guernsey.
Aug. 31	PARISH CHURCH AT BISHOPSWEARMOUTH.—Limited to Sunderland architects. Conditions from H. E. Hinckley, 68, Cleveland Road, Sunderland. Deposit one guinea.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Summary of particulars given last week. Conditions from the Secrétariat de l'Association du Monument de la Réformation, 56, Rue du Stand, Geneva.
No date.	SITE PLAN FOR COTTAGE EXHIBITION, SWANSEA, 1909.—Gold, silver and bronze medals, with prizes of £25, £15 and £10. Particulars from Henry R. Aldridge, 7, Gower Street, Swansea.
No date.	NATIONAL LIBRARY BUILDINGS, ABERYSTWYTH. — Architects desirous of competing should send designs and photographs of libraries, or similar buildings erected under their direction, to J. E. Davies, Hon. Secretary, National Library of Wales, Aberystwyth.

Our Plate.

The Casa del Diavolo, Vicenza.

This building, known locally as the Antica Posta, and also as the Palazzo Giulio Porto, was erected in 1570. Although only these two bays were ever executed, they are sufficient to show that if the façade had been completed it probably would have ranked as one of the finest of Palladio's palaces. The frieze windows should be noted, this arrangement being only possible to Palladio by reason of the immense scale of the building, which, like most of the works of this master in Vicenza, is constructed, above the level of the pedestal bases, of brick faced with stucco.

Notes and News.

A PERMANENT BUILDING TRADES EXHIBITION is proposed to be formed in Liverpool.

* * *

"COLOURED DESIGNS FOR WALL AND CEILING DECORATIONS" comprise ten plates (accompanied by descriptive text), of which two show schemes for ceilings, the remainder showing designs for the walls of various rooms, and for a hall. The designs are issued, price 4s., by the Trade Papers Publishing Co., Ltd., 365, Birkbeck Bank Chambers, High Holborn.

* * *

A NEW RESIDENTIAL HOTEL, to be called "Wellington House," is being completed at the corner of Buckingham Gate and York Street. The building, seven storeys high, has taken nearly two years to erect, and is of a most elaborate description. The total cost, including site, will be about £100,000. Messrs. Palgrave and Co. are the architects, and Mr. C. Gray, of Kensington and Shepherd's Bush, is the general contractor.

* * *

BATH ELECTRIC LIGHT UNDERTAKING.—The Bath Corporation have resolved, subject to the assent of the Board of Trade, to sell their electric lighting undertaking, which they purchased from a company in 1896, to Mr. Schenk, acting for a syndicate which holds large powers of supply in the surrounding country, on terms which relieve the Corporation from all financial responsibility, and show a profit calculated at £65,000.

* * *

WIDENING OF NEWPORT BRIDGE.—The transporter bridge opened at Newport in 1906 has not solved the traffic difficulty over the Usk, and the Parliamentary Committee of the Newport Corporation are now contemplating the widening or the reconstruction of the old Newport Bridge. The committee have been advised by their engineer that the bridge cannot be widened on both sides except at an enormous cost, but that a widening can be effected on the northern side with a reasonable measure of safety.

* * *

A DRILL HALL is to be erected in Cathays Park, Cardiff, from designs by Mr. W. H. Dashwood Caple, F.R.I.B.A., of Cardiff. It will provide for a separate drill hall for each of the six units having headquarters at Cardiff, all under one main roof, so arranged that the whole can be turned into one large hall for use on any public occasion. This large hall is to provide seating accommodation for more than 10,000 people. The general plan is rectangular, with a three-span steel-framed roof over a total span of about 220 feet.

* * *

A BLOCK OF OFFICES, with residential flats above, is just being completed on the Vauxhall Bridge Road. The building, to be known as "Ashley Mansions," is seven storeys high, the elevation being carried out in red bricks, with gauged work, and modelled terra-cotta dressings by the Hathern Station Terra Cotta Co., Ltd. The building has been erected for the Central London Estates, Ltd., by Mr. C. Gray. Messrs. Palgrave and Co., Westminster, are the architects.

* * *

A PATENT ASBESTOS WOOD has been put on the market by the Calmon Asbestos and Rubber Works, Ltd. (London office, 1-3, Trinity Place, Tower Hill, E.C.). It is claimed to be absolutely non-flammable, while adapted for work of all descriptions, as it can be planed, sawn and turned just as mahogany, walnut, oak, etc.; moreover, it is stated to be cheaper in price, and of light weight. Two cabins, with walls, ceiling, furniture and fittings throughout of Calmon's Patent Asbestos Wood, will be shown at the forthcoming first German shipbuilding exhibition.

Law Case.

ACTION AGAINST THE PLASTERERS' ASSOCIATION.—In the King's Bench Division on Thursday last, judgment was given by the Lord Chief Justice in the action described by counsel as one of the last of the actions under the old state of the law with regard to trades unions, that brought by Mr. William Smithies, a Birmingham master plasterer, against the National Association of Operative Plasterers and its officials, and J. W. Forrester and W. H. Ecclesby, skilled plasterers and scagliola workers. Against all the defendants, except the last two, damages were claimed for unlawfully and maliciously inducing and compelling workmen in the employment of the plaintiff to break their contracts and to cease work. An injunction was also asked for. Against Forrester and Ecclesby damages were claimed for breach of agreement. Defendants denied the various allegations, and pleaded that the association was not responsible, and that the plaintiff put an end to the contracts between himself and his workmen by employing a foreman named James Gibbs, who was obnoxious to the association, and refusing to refer his continued employment to the Conciliation Board.—The Lord Chief Justice found that the defendant association sanctioned the calling out of the men, *bona-fide* believing they were within their rights, after having given the necessary six days' notice of arbitration. He held that the men formed the impression, not without some foundation, that the masters were not willing to submit the original dispute to arbitration, but were trying to delay the matter. The men were called out, not to break their contracts, but because they could not get the dispute with regard to the employment of Gibbs settled by arbitration. With regard to the individual liability of Ecclesby and Forrester for breaking their contracts, there was no defence, and his lordship assessed the damages against them at £25 each. He gave judgment against them for that amount, with county court costs. Against the other defendants the action would be dismissed with costs.

THE CONSTRUCTION OF A GOTHIC VAULT.

BY JAS. S. BOYD.

(Concluded from p. 470, No. 695.)

Projection of Springer—Bed Moulds.

It has already been stated that the solid springers consist of level courses of masonry which contain that part of the vault in which the interpenetrations of the rib-mouldings occur. In old work these mouldings may have been worked in either of two ways. First, the springer may have been built with solid unmoulded blocks with skewbacks for the actual ribs worked on the top course, and, after setting the moulded rib-stones on the skewbacks, the interpenetrations of the mouldings may have been first roughly blocked out and afterwards carefully cut in detail, or a preferable and more likely method would have been to draw upon each bed of the stones the mouldings of each rib in their proper place, which would show where the mouldings cut into each other at the various level beds. It has been proved this was the method actually employed in mediæval times, although it is quite possible that the practice varied in different districts according to the nature of the materials and the skill of the workmen.

Figs. 18 and 19 show how these oblique sections of the mouldings are projected into the plan in order that the bed moulds may be cut to their outlines. The example shown by this diagram is for a vault with the lower part of all the ribs struck with the same radius. Thus the edge of each rib is at the same distance from the point of intersection of the centre lines of all the ribs.

As the beds of the stones cut the mouldings obliquely, it will be evident that the bed mould for each horizontal bed (except the bottom bed) will be an elongation of the normal section mould of the ribs. Now, Professor Willis mentions that "in old work examined, the same section mould was used, both for the normal joints and the oblique joints; consequently, these mouldings were drawn in and contracted very disagreeably." The author was led by this statement to examine very carefully the jointing of various springers in the Glasgow Cathedral vaulting, where ample verification of the statement was found. In the aisles of the Lower Church the contraction of a group of mouldings in some cases was as much as a half-inch in a distance of a foot (see Fig. 21). This contraction of the mouldings is unobservable on looking up at the vault.

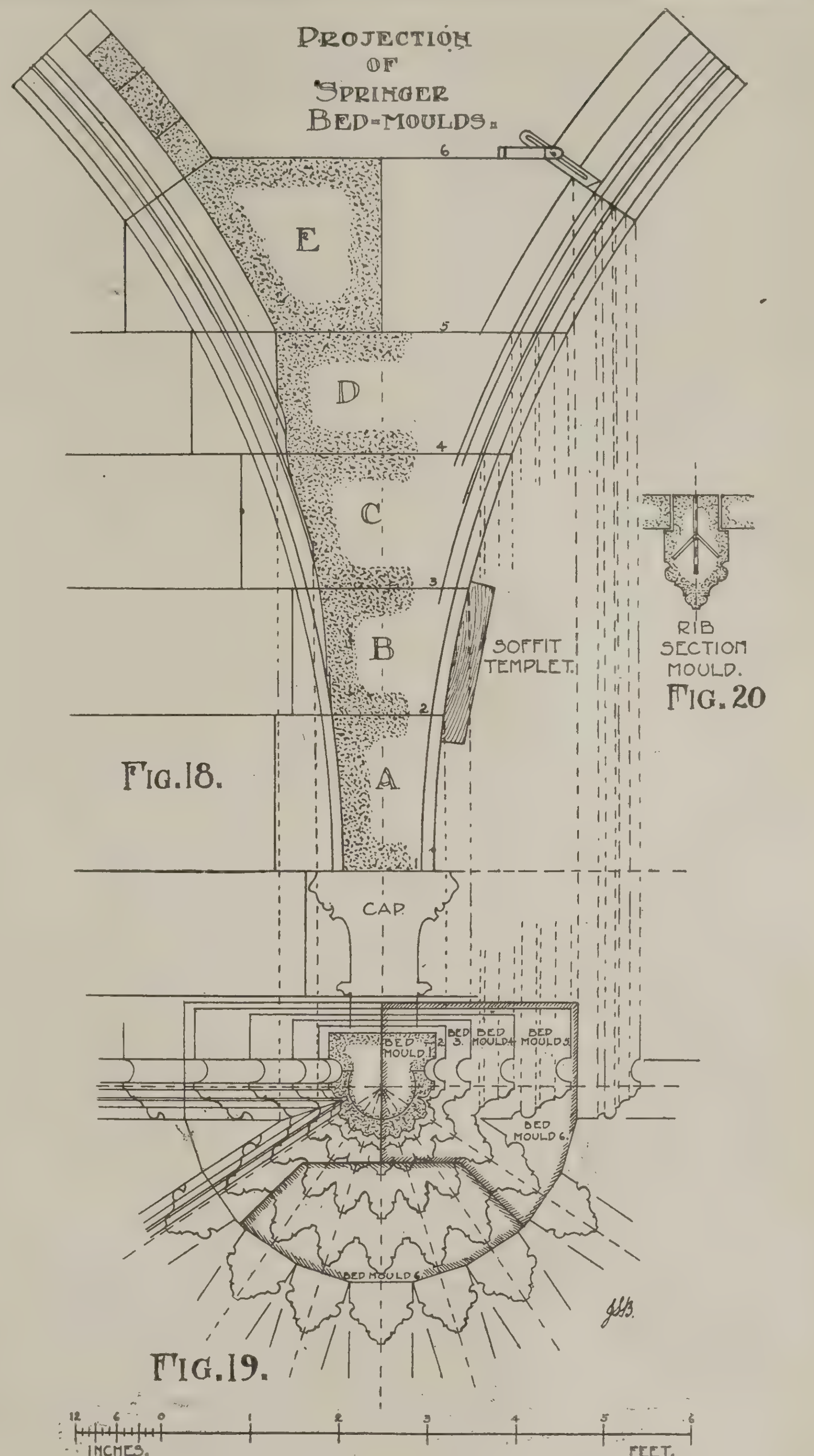


FIG. 18. FIG. 19. FIG. 20

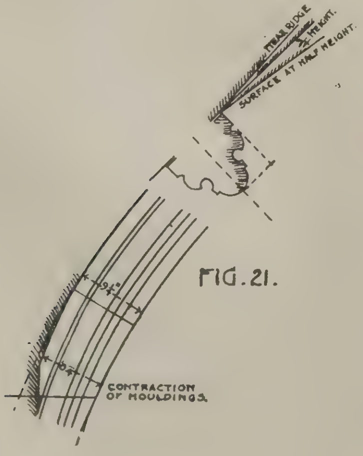


FIG. 21.

The Infilling.

The infilling courses of the vaults are not commonly laid level, but in most examples of old work they have an inclination downwards to the diagonal rib (see elevation of vault, Fig. 1 on centre plate, BUILDERS' JOURNAL, June 3rd). It is difficult to say what might have been the reason for this, but it is especially common in the earlier work. The author's opinion is that they are thus laid so that the thrust of the infilling may be equally distributed between the two boundary ribs of the web (see arrows, Fig. 23). Compare this with Fig. 22, where the courses are laid parallel with the ridges. In some old examples the courses are laid so as to meet the diagonals at right angles.

Mr. Francis Bond, M.A., in his excellent work on "Gothic Architecture in England," gives a good description of the manner in which the web construction was probably carried out in England and France, of which the following is an abbreviated account:—

In French work it was usual to build the domical courses of the web with tapering-stones, but the English builder kept the stones of the courses parallel. To illustrate how each proceeded with the construction, the plan of a web may be considered as contained between a wall rib and a diagonal rib (Figs. 22 and 23).

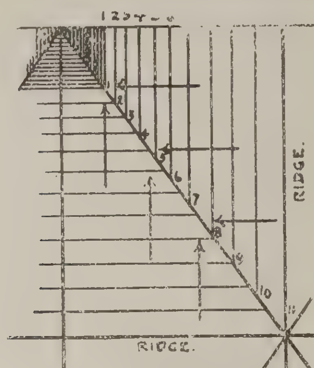


FIG. 22.

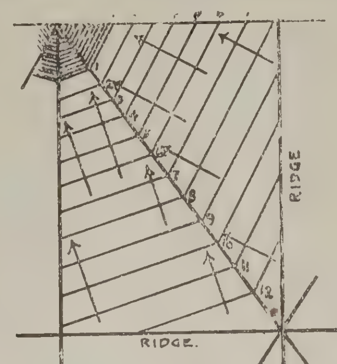


FIG. 23.

The English mason takes a parallel batten or plank (I.I), and cuts it to rest with one end on the wall rib and the other on the diagonal rib (Fig. 23). He now builds on this a course of stone, parallel in breadth from end to end. Another parallel batten is laid, and another course of stone, and so on, till the ridge is reached, where the joint is found to be very ragged and made up of stones which vary a great deal in form, size, and strength, owing to their wedge shape in plan.

The French builder takes similar battens, but he tapers each as it is laid (Fig. 22); and as each stone in the course is laid it is also tapered, so that when the ridge is reached the joint there is a clean, straight, and solid bed.

Materials.

The material used for the infilling of the vault cells should be as light as possible. Thus, in old examples in some parts of England, chalk, tufa and brick have been used, but in Scotland sandstone is the material most commonly used for all parts of the vaulting.

In old work the infilling courses of rubble or ashlar were made as thin as possible, in order to reduce the weight of the vaults, and on the back of this was laid a rough layer of rubble, with a covering of light concrete. These additional layers are not so common in late work as they were in early work, and they are not at all necessary to the stability of the vault.

Lime mortar should be used in preference to cement mortar, which stains the stonework, and prevents elasticity in the vaulting.

Cutting of Springer Stone C (Figs. 18 & 19).

The form and dimensions of the block of stone required are to be obtained from the section and plan as shown in these figures, but the distance that the stones extend into the wall may vary considerably, and would be greater than is shown by the bed moulds.

Begin by working the top bed of the stone, and on it scribe the bed mould No. 4, as in Fig. 24. Next work the vertical joint at the back of the stone at right angles to the top bed, and square down a line on this joint from the point X on the top bed. Now bring the stone to its height by working the bottom bed to a gauge taken from the vertical section (Fig. 18), and scribe bed mould No. 3. The soffit template (which is the same for all the ribs) is scribed on the vertical joint, and from this the concave surface forming the soffit of the wall rib and the curved joint which fits against the extrados of the wall arches is now cut. (Fig. 25).

Sink a broad draft opposite the transverse rib to the soffit template applied between the lines of the bed moulds on both beds. (Fig. 25).

Next knock off the surplus stone at the angles, and work surfaces to contain the soffits of all the ribs (Fig. 26). Now mark the parallel lines of the rib edges by means of a flexible straight-edge made of stout zinc, and sink the mouldings to the lines on each bed, as indicated in the figure.

Top Course of Springers.

This top course, being too large to be cut from one stone, is made up of three pieces jointed as shown on the plan, Fig. 19. No horizontal projection of the mouldings is required for the top bed mould, as the first radiating joint is put on the stone before any of the mouldings are cut. For the bottom bed of this course, however, bed mould No. 5 is required.

Left-hand Stone in Course E, Fig. 18.

First work the top bed, and at right-angles to it, cut the two vertical joists shown in Fig. 27. Scribe in bed mould No. 6, and from the point X square down a line on the vertical joint. Gauge the stone to its exact height and work the bottom bed, on which bed mould No. 5 is now scribed. The vertical joints which occur between the front and two side stones of the course are next worked to the lines on each bed. With a bevel set to the radiating joint in the section Fig. 18, cut the radiating joints of the wall and intermediate ribs, and on these joints scribe as-

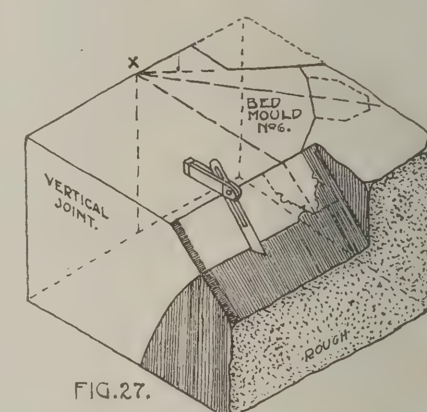


FIG.27.

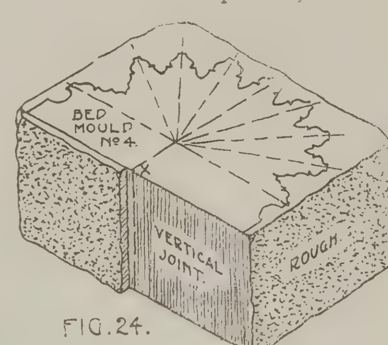


FIG.24.

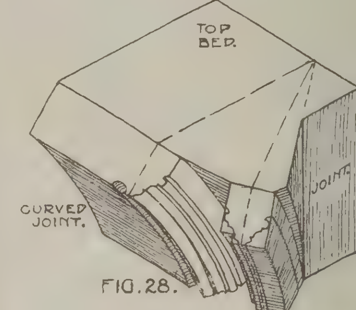


FIG.28.

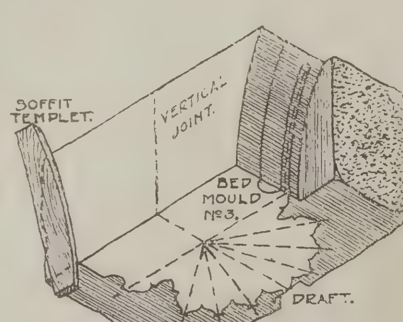


FIG.25.

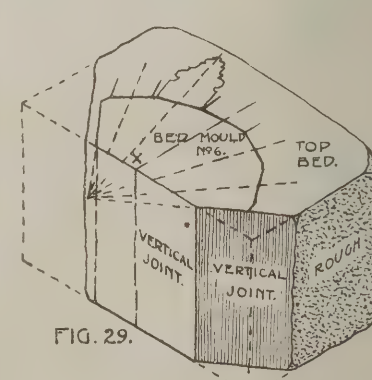


FIG. 29.

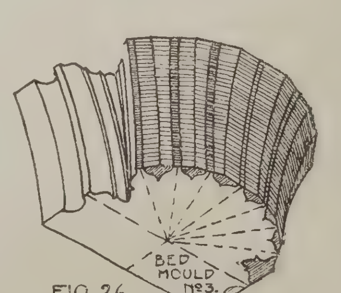


FIG.26.

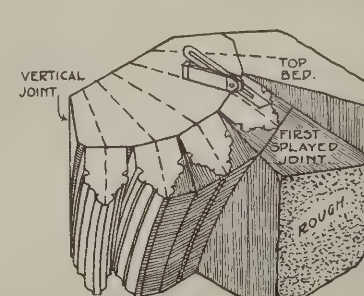


FIG.30.

much of the normal section mould (Fig. 20) of the ribs as is required. (See Fig. 27). Now work the soffits of the ribs, using the soffit template as already described: draw in the parallel lines of the rib edges, and sink the mouldings in the manner indicated by Fig. 28. Notice that part of the infilling surface of the vault is worked on the solid stone between the ribs.

Front Stone in Course E, Fig. 18.

Begin by working the top bed, and on it scribe in as much of bed mould No. 6 as is required. (See Fig. 29). Square from this bed cut the back and two side vertical joints. Square down the centre line from point X, and gauge the stone to its height, working the bottom bed, on which is now scribed bed mould No. 5. With the same bevel as was used for the last stone, work all the radiating joints, and on each of the joints thus cut scribe the normal section mould of the ribs (Fig. 30). The soffits of the ribs are all sunk to the soffit template as already explained, and the lines of the rib edges and mouldings trammelled on. Lastly, the mouldings are worked through from the radiating joints to the bottom bed as shown in the figure. In this stone it will be noticed that there are small portions of the vault surface to be cut between some of the ribs.

Cutting of a Boss Stone.

The boss stone under consideration is one of the small ones on the level ridge rib of the vault in Figs. 1 and 3 (see centre plate in BUILDERS' JOURNAL, June 3rd), and its plan and sections are redrawn in Figs. 31, 32 and 33 to show clearly the joint bevels of the ridge and intermediate ribs.

Begin by working the top bed of the boss as an operation plane, and on this bed scribe the bed mould. At right angles to this surface, and to the lines of the bed mould, the vertical sides of the four rib stumps are cut, as in Fig. 34. Now cut the skewback joints of the ridge ribs to the bevel shown in Fig. 33, and on these joints square down centre lines of ribs and scribe the normal section mould, as in Fig. 34. Although these joints are splayed about $\frac{3}{4}$-in. or 1in., yet the normal section mould is sufficiently accurate for practical purposes. Next, the joints of the intermediate ribs are cut by the bevel in Fig. 32. Draw the centre lines of the ribs, and on each joint mark the distance of the soffit of these ribs from the top bed by measurement from Fig. 32, and scribe the section mould (Fig. 35).

In the case of the boss stone at the intersection of the intermediate rib D with the curved ridge rib in Fig. 3, a saving in material may be effected by working the small vertical part above the radiating joints first, and with a bevel set as at

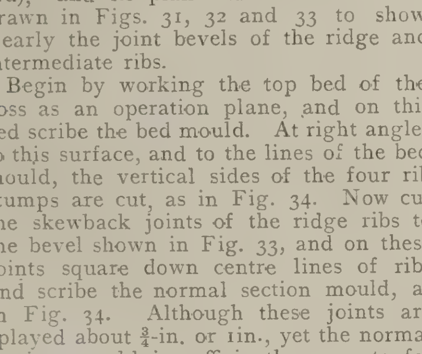


FIG.33. FIG.32. FIG.31.

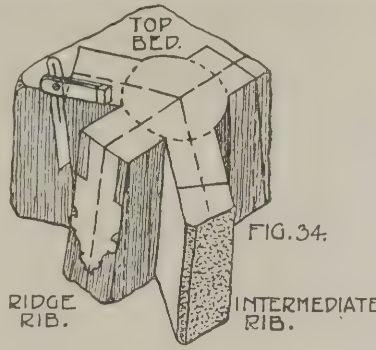


FIG.34.

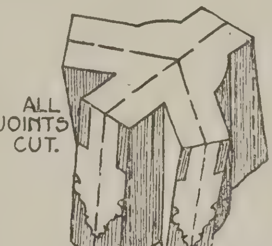


FIG.35.

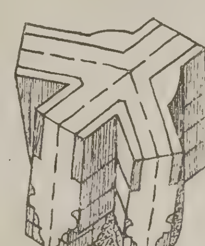


FIG.36.

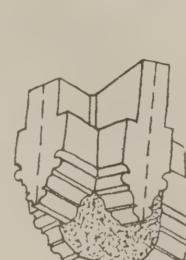


FIG.37.

X, Fig. 32, the radiating joints may be cut. Next the soffits of the stumps are worked (Fig. 36), those of the ridge rib being level, while those of the intermediate ribs are cut to a small zinc bevel taken from the joint in Fig. 32. The spherical part of the boss is now roughed out to a suitable size for the carving, and the mouldings and checks trammelled in parallel to the soffits, Fig. 36. The mouldings are now roughed out to meet the rough part of the boss; then the checks for the infilling are cut, and the mouldings completed. (See Fig. 37 for sketch of finished stone).

The author is of the opinion that a somewhat similar method to the above was adopted by the Gothic masons, as detached fragments of old examples clearly show the scribings on the top bed and joints.

When the whole of the boss-stone and the voussoirs of the ribs are completed, the latter may be erected, and each boss will be held in its proper place by the abutment of the ribs to which it belongs and of which it constitutes a voussoir.

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
The querist's name and address must always be given, not necessarily for publication.

Books on Flats.

Y writes: "Please name any book dealing with flats."

The best book on the subject is Mr. Sydney Perks's "Residential Flats of all Classes, including Artisans' Dwellings," published by Mr. B. T. Batsford, 94, High Holborn, W.C., price 21s. net. Another book recently published is Mr. Shaw Sparrow's "Flats, Urban Houses, and Cottage Homes," published by Messrs. Hodder and Stoughton, 20, Warwick Square, E.C., price 5s. net.

The Queen Victoria Memorial.

GLASGOW.—W. writes: "Who were the competing architects in the competition for the National Memorial to Queen Victoria, and what was stated as the probable cost of erection?"

The competing architects were Sir Aston Webb (whose design was selected, with Mr. Brock as sculptor), Mr. T. G. Jackson, Sir Rowand Anderson, Sir Thomas Drew, and Mr. Ernest George. All five designs were produced in our issue for November 6th, 1901. The estimated cost was put (we believe) at £200,000.

L.C.C. Regulations as to Exits.

CLAPTON.—N.G.H. writes: "With respect to a mission hall that is about to be rebuilt, admission to concerts will be obtained by ticket only. Will the L.C.C. theatre regulations as to exits, etc., apply?"

We are officially informed that, if it is proposed that concerts to which the public will be admitted shall be given at the mission hall referred to, the hall should be constructed in accordance with the Council's regulations under section 12 of the Metropolis Management and Building Acts Amendment Act, 1878, and application should be made to the Council for a certificate under that Act. Application should also be made for a music licence for the hall. It is further stated officially that if the general public can obtain admission to a concert, the fact that money is not taken at the doors does not obviate the necessity for a license.—In reply to a further question, we are not acquainted with any books dealing specifically with the subject you mention.

Horsham (Sussex) Parish Church.

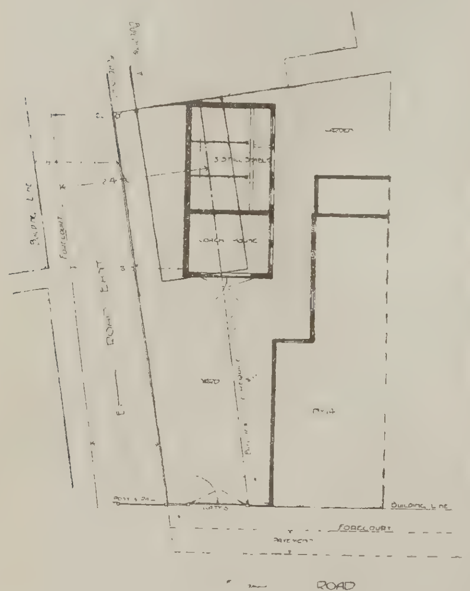
WALLINGTON (SURREY).—F.S.R. writes: "Kindly supply a short account of Horsham Parish Church."

This church was enlarged and almost rebult in 1865. It is Early English, with Perpendicular additions. The nave and chancel are of one pitch; the chancel gable being terminated on each side by Early English buttresses, capped with pinnacles. The interior roof is Perpendicular; the lofty arches are Early English, and so is the clerestory. Portions of the tower may be Norman; the large chantry adjoining the north porch is apparently that called the Trinity Chantry, founded by Sir John Caryll, *temp.* Henry VIII. There is a fine Perpendicular English window of seven lights, with stained glass by O'Connor. The peal of bells (eight) is one of the finest in the country, the tenor bell weighing 24 cwts. Horsham was long in the hands of the powerful

house of Braose, to whom the building of the church may be attributed, and whose wealth seems to have been as freely bestowed here as at Shoreham. H.Y.M.

Width of Street and Line of Frontage.

MIDDLESEX.—BY-LAW writes: "The accompanying plan shows a piece of land which has its frontage to a road named —— Road, and a return frontage to —— Road East. —— Road East is a narrow road, but has buildings on both sides, with small forecourts in front, and the building lines are clearly defined on both sides. A house and shop, No. 14, has recently been erected on the land in question, leaving a yard at the side and a garden at the rear. Plans submitted to the Council for the erection of a stable and coach-house have been disapproved by the Coun-



cil. My contention is that the frontage or abuttal is to the —— Road, and that so long as the building line is adhered to in ——Road East, the Council have no right to disapprove the plans."

The by-law quoted appears to be in the usual form, and is no doubt in order. It aplies to *all* streets in the district, and therefore I am of opinion that the Urban District Council are within their legal powers in refusing to allow any building to be erected in such a way as to leave less than 24ft. in front of it on the —— Road *East* side, as well as in the main road in front of No. 14; and as the width of the East Road is only 11ft., this means that you must set your building back 13ft. This seems a rather hard case, and one in which perhaps the Council should not rigidly adhere to their by-law, but this is within their discretion.

F.S.I.

Calculated Strength of Concrete and Steel Floors.

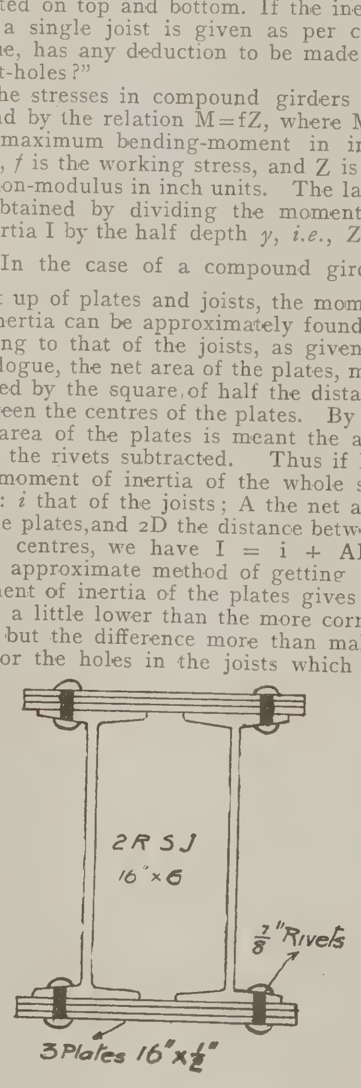
LONDON, N.—NALLA writes:— "Please give a comparatively simple formula for calculating the strength of solid concrete floors composed of small joists, say, 4ins. by $1\frac{3}{4}$ins., at 2ft. centres, in 6ins. to 7ins. of concrete (ballast). Also what is the relative compressive strength of ballast and breeze concrete?"

The calculation of these floors cannot quite follow the same formula as reinforced concrete floors, as the latter have a more scientific distribution of the metal. Approximately, small rolled steel joists, embedded in concrete, will carry an increased proportion of load, as the depth of concrete exceeds the depth of joist; this is as compared with the tabular strength of free joists. Rolled joists 4ins. by $1\frac{3}{4}$ins. by 5lbs. per foot run, embedded in cement and broken brick concrete 1 : 2 : 4 7ins. total depth, including 1in. cover at bottom, and 2ft. centre to centre, will carry about 50 per cent. more than the tabular strength of the free joist, or say, $1\frac{1}{2}$cwts. per foot super. over a span of 10ft. According to experiments made in America by Mr. W. H. Vance, coke-breeze concrete is 40 per cent. lighter and 45 per cent. weaker than concrete made with broken stone. HENRY ADAMS.

Finding Stresses in Compound Girders.

MANCHESTER.—J.S. writes: "Please show the practical method of figuring out (not by graphics) compound girders, by the moments of resistance and inertia, as given in manufacturers' catalogues for the joist compound girders, with plates riveted on top and bottom. If the inertia for a single joist is given as per catalogue, has any deduction to be made for rivet-holes?"

The stresses in compound girders are found by the relation $M = fZ$, where M is the maximum bending-moment in inch-tons, f is the working stress, and Z is the section-modulus in inch units. The latter is obtained by dividing the moment of inertia I by the half depth y, *i.e.*, $Z = \frac{I}{y}$. In the case of a compound girder, built up of plates and joists, the moment of inertia can be approximately found by adding to that of the joists, as given in catalogue, the net area of the plates, multiplied by the square of half the distance between the centres of the plates. By the net area of the plates is meant the area with the rivets subtracted. Thus if I is the moment of inertia of the whole section: i that of the joists; A the net area of the plates, and 2D the distance between their centres, we have $I = i + AD^2$. This approximate method of getting the moment of inertia of the plates gives results a little lower than the more correct one, but the difference more than makes up for the holes in the joists which we



have neglected. The following numerical example should make this quite clear. A compound girder is made up of two 16in. by 6in. by 62lb. R.S.J.'s, and six 16in. by $\frac{1}{2}$in. plates, $\frac{7}{8}$in. rivets being used (see accompanying figure). From the tables we see that the moment of inertia of a 16in. by 6in. by 62lb. R.S.J. is 725.7in. units, therefore $i = 2 \times 725{\cdot}7 = 1451{\cdot}4$. In this case $A = (16 - 2 \times \frac{7}{8})\ 6 \times \frac{1}{2} = 42{\cdot}75$ $2D = 17{\cdot}5$, therefore we have:—

$$I = 1451{\cdot}4 + 42{\cdot}75 \times 8{\cdot}75^2$$
$$= 4721 \text{ inch units.}$$

$$\therefore \text{Section modulus} = \frac{I}{y} = \frac{4721}{9{\cdot}5} = 497 \text{ inch units.}$$

Then taking the working stress at 7 tons per square inch we have the safe $B\,M = f\,Z = 7 \times 497$ inch-tons $= 3479$ inch-tons. The B M is then found in terms of the load and the span. For a uniformly distributed load W as a span L, the max. $B\,M = \frac{W\,L}{8}$. Therefore in this case safe load $= W = \frac{3479 \times 8}{12\,L} = \frac{2319}{L}$ where W is the load in tons and L the span in feet. A.

Examination Papers in Building Construction.

NORWICH.—ENQUIRER writes:—"Please state where copies of questions set at recent South Kensington examinations in Building Construction can be obtained."

The questions set at previous examinations of the Board of Education in Building Construction are published, with their diagrams, by Wyman and Son, price 6d., in a volume bearing the title of "Science Examination Papers" (here follows date of year). HENRY ADAMS.

Preventing Acquisition of Right of Light.

BOURNEMOUTH. — YOUNG HOUSEHOLDER writes: "A and B have built adjacent houses. B has two windows which overlook and obtain light over A's property. How shall A proceed to prevent these windows ever becoming 'ancient lights'? A does not wish to be unneighbourly and erect a hoarding to block out the light. A's property was first erected, B's some three months later. Neither has been up twelve months yet. Is there not some form of agreement in which a small sum of money is paid yearly, preventing a free right of light?"

In the circumstances mentioned, B will acquire a right of light for both his windows only after a period of twenty years' enjoyment—so that there is no need for immediate action. It is wise, however, to endeavour to come to some terms at once, and I recommend that A should ask B to pay a small yearly sum (say, one shilling) as an acknowledgment that the light to these windows is only enjoyed by arrangement, and not as a right. If A's neighbour will not agree to this plan, I know of no better course than that A should erect a barrier on his own land in such a way as to obstruct the light to both the ground-floor and first-floor windows. F.S.I.

Correspondence.

A new Method of Building with Tiles.

To the Editor of THE BUILDERS' JOURNAL.

SIR,—I was much interested in reading the short article in your issue for May 27th in regard to what is described as a new development in the use of tiles by a Spanish firm. Your readers may be interested to know that this is nothing new in England. As far back as 1872 the system of arching described was adopted in some new buildings for Marlborough College, under the late G. E. Street, architect. These arches are very strong, light, and economical in space, as a much less rise than that shown in the illustration to the article in question is sufficient.

I have used the same in other works since that time, and have often wondered why more use was not made of the system.

I have always done these arches on a boarded centre, afterwards removed when the work has set. Three layers of tiles, with the bond properly crossed, will bear a very considerable weight.

J. E. BATCHELOR,
Building Surveyor.

RETAINING WALLS IN THEORY AND PRACTICE.

BY T. E. COLEMAN.

(Concluded from page 423, No. 692.)

When a retaining wall sustains a bank of earth, having an indefinite surcharge, the pressure of the surcharged earth must be taken into consideration, and the equation then becomes

$$\text{(B)} \qquad P = \frac{wH^2}{2}\cos\theta \; \frac{\cos\theta - \sqrt{\cos^2\theta - \cos^2\phi}}{\cos\theta + \sqrt{\cos^2\theta - \cos^2\phi}}$$

When the surcharge slopes at the same angle as the angle of repose for earth, then $\theta = \phi$, and the last-named equation may be expressed in the following simplified form :—

$$P = \frac{wH^2}{2}\cos\phi$$

In the case of a retaining wall having a "definite" surcharge—*i.e.*, supporting a surcharged bank with horizontal top, as in Fig. 60—the total earth pressure to be

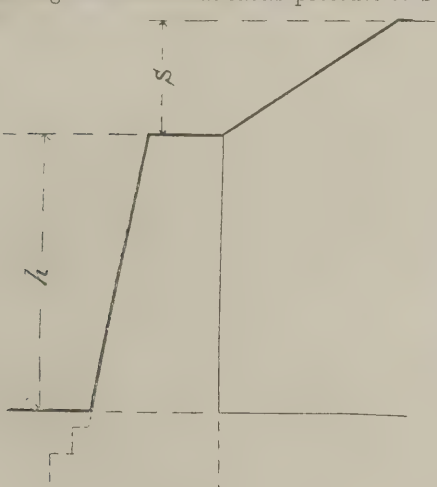


FIG. 60.

sustained is intermediate in amount between that caused by a bank with level top, and that given by a bank with indefinite surcharge. The thickness of wall required to support a bank having a definite height of surcharge may be approximately determined by ascertaining the respective thicknesses necessary for a wall *without* surcharge, and also with indefinite surcharge, afterwards interpolating between the two by means of Rankine's formula :—

$$t = \frac{ht' + st''}{h + 2s}$$

where

t = thickness of wall in feet, necessary to support a bank of earth with *definite* surcharge.

t' = thickness of wall in feet, necessary to support a bank of earth *without* surcharge.

t'' = thickness of wall in feet, necessary to support a bank of earth with *indefinite* surcharge.

h = height of wall in feet.

s = height of definite surcharge in feet.

It has been previously mentioned that the common formula for ascertaining the total horizontal pressure of earth (P) acting on a vertical plane at the back of a retaining wall is as follows :—

$$P = \frac{w}{2}\left\{BC - \sqrt{BC\,(BC - AH)}\right\}^2$$

By the application of this general geometrical construction, the amount of earth pressure acting on any retaining wall may be readily found by the *graphic* method, as indicated in the following typical examples,

Let A B F S (Fig. 61) represent to any desired scale the section of a retaining wall without surcharge, of which A B is the vertical plane at the back of the wall. Let K B E represent the angle of repose (ϕ) for earth. At A draw A H perpendicular to B E, and at B draw B C perpendicular to B E, meeting the plane of the surface slope at C. The angle A B C = angle K B E = ϕ. Make C D = C A, and draw A J perpendicular to B C.

Then it can be shown that

$$\text{Total horizontal earth pressure} = \frac{w}{2}BD^2$$

For

$$\begin{aligned} CJ &= BC - AH \\ CD^2 &= CA^2 \\ &= BC \times CJ \\ &= BC\,(BC - AH) \\ CD &= \sqrt{BC\,(BC - AH)} \\ BD &= BC - CD \\ &= BC - \sqrt{BC\,(BC - AH)} \\ BD^2 &= \left\{BC - \sqrt{BC\,(BC - AH)}\right\}^2 \\ \therefore\; P &= \frac{w}{2}\left\{BC - \sqrt{BC\,(BC - AH)}\right\}^2 \\ &= \frac{w}{2}BD^2 \end{aligned}$$

When the wall sustains a bank of earth with indefinite surcharge, but sloping at an angle (θ) which is less than the angle of repose (ϕ) of the sustained earth, the total horizontal pressure is ascertained graphically as shown in Fig. 62, the construction being a modification of the preceding method. The surface slope is continued to C so as to intersect the line B C drawn at right angles to B E. With B C as diameter construct the semicircle B M C, and from A draw A M parallel to B E. Make C D = C M

Then, as in the preceding case,

$$\begin{aligned} P &= \frac{w}{2}\left\{BC - \sqrt{BC\,(BC - AH)}\right\}^2 \\ &= \frac{w}{2}BD^2 \end{aligned}$$

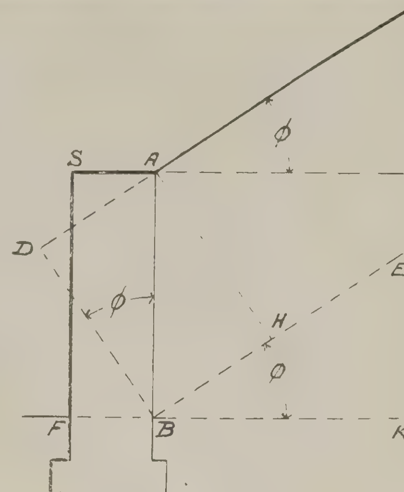


FIG. 63.

If the slope of the surcharged earth is the same as the angle of repose for earth, as indicated in Fig. 63, then $\theta = \phi$, and the points C and D of the preceding figures coincide with each other.

$$\begin{aligned} P &= \frac{w}{2}\left\{BC - \sqrt{BC\,(BC - AH)}\right\}^2 \\ &= \frac{w}{2}BD^2 \end{aligned}$$

Similarly when the bank of earth slopes away below the level of the top of the wall, as in Fig. 64, the total horizontal pressure is found in precisely the same manner as described for Fig. 62, so that

$$\begin{aligned} P &= \frac{w}{2}\left\{BC - \sqrt{BC\,(BC - AH)}\right\}^2 \\ &= \frac{w}{2}BD^2 \end{aligned}$$

It will be observed that the foregoing examples of graphic construction indicate the total earth pressure on a vertical plane with "indefinite" surcharge. The thickness of wall required for supporting earth with "definite" surcharge may be ascertained by determining the necessary thickness for a wall without surcharge, and with "indefinite" surcharge respectively, and afterwards interpolating between the results thus obtained, according to the height of the surcharge under consideration; or the approximate thickness may be found by means of Rankine's formula $t = \dfrac{h\,t' + s\,t''}{h + 2s}$ as already explained.

Direction of Thrust of Retained Earth.

With regard to the *direction* in which the thrust or pressure of the earth is con-

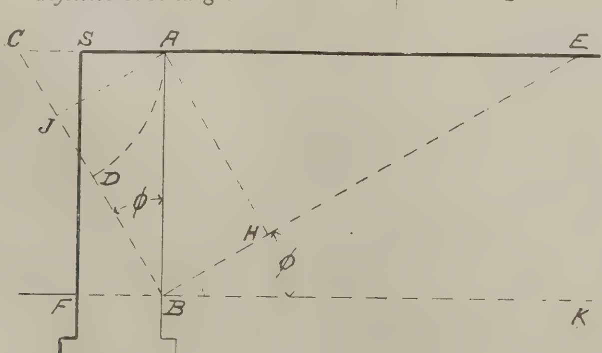


FIG. 61.

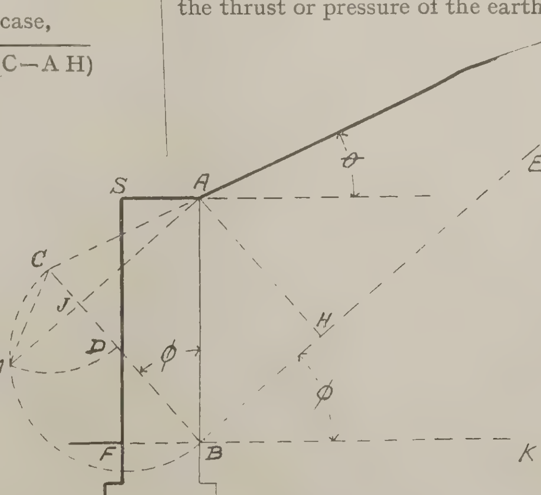


FIG. 62.

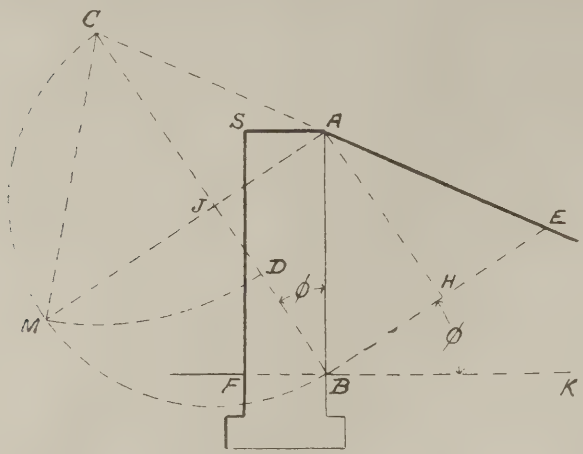


FIG. 64.

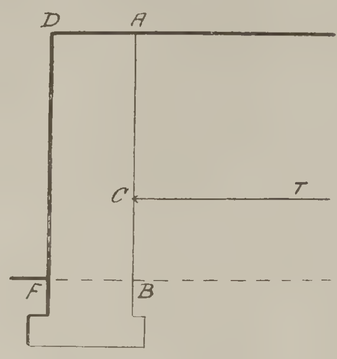


FIG. 65.

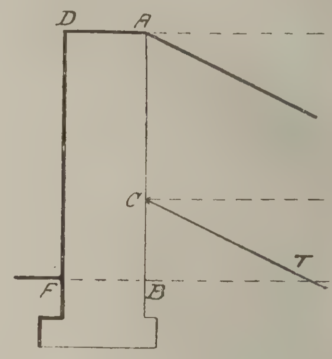


FIG. 67.

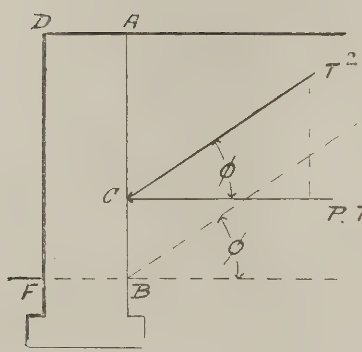


FIG. 68.

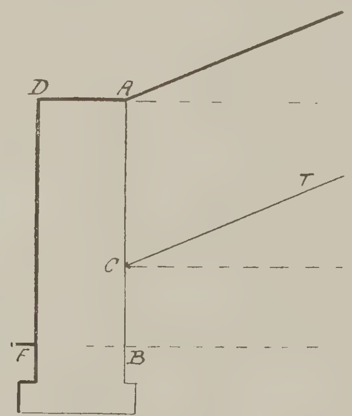


FIG. 66.

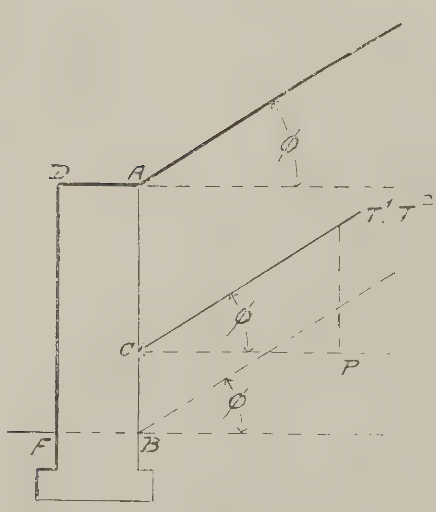


FIG. 70.

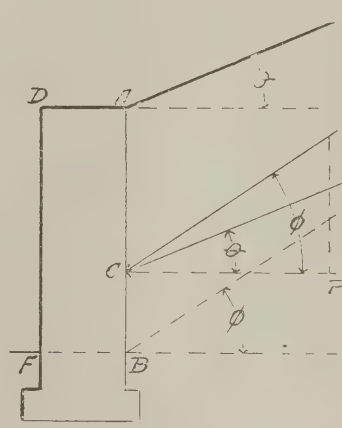


FIG. 69.

sidered to act, several theories have been formulated from time to time. In the investigations which were made by Poncelet and Moseley, the direction of the earth pressure was assumed to be always *horizontal*, the frictional resistance of the earth being omitted from consideration. Whilst this assumption would be true for substances having no friction—such as liquids, &c.—yet for earths and other similar materials, it is found in practice that the direction of the thrust is considerably modified by the friction of the earth particles.

According to Rankine, the pressure of retained earth may be considered as acting in a direction *parallel to its surface slope*. On this hypothesis, for a bank of earth with horizontal top, the direction of the thrust (T) at the back of a retaining wall would be horizontal, as indicated in Fig. 65, whilst in all other cases of sloping embankments the thrust (T) would be parallel to the earth slope as in Figs. 66 and 67. In the latter case, it would therefore appear that when the bank slopes away from the wall, the back of the wall is subjected to an upward thrust, but it is obvious that such a result does not represent the conditions which actually exist under these circumstances.

The researches of Dr. Scheffler tend to show that the direction of the thrust of a bank of retained earth is *parallel to its angle of repose* in all cases, and although this theory is not yet conclusively proved, yet it is now generally accepted. The value of the earth thrust (T) at the back of a retaining wall is therefore obtained by multiplying the total horizontal earth pressure (P) by the secant of the angle of repose, so that $T = P \sec. \phi$. It has been found from numerous experiments that the results obtained by the adoption of this theory in the calculation of the stability of retaining walls may be depended upon as providing the necessary element of safety in actual practice.

A comparison of the direction of earth pressures as given by Rankine and Scheffler respectively is given in Figs. 68, 69, and 70, where T^1 = direction of thrust as given by Rankine and T^2 that of Scheffler. It will be observed that when the slope of the surcharge is the same as the angle of repose for the earth (ϕ) as in Fig. 70, then the direction of the thrust is the same in both cases.

ERRATA.—It is pointed out by the author that in the preceding part of the article on "Retaining Walls" in our issue for May 13th, there were two printers' errors, namely, in the first column on page 423, $\frac{1}{2}wh^2\tan^2(90°-\phi)$ should read $\frac{1}{2}wh^2\tan^2\frac{1}{2}(90°-\phi)$, and $\frac{wD}{2}$ should read $\frac{wD^2}{2}$. We regret the occurrence of these errors.

WATER PURIFICATION.

A paper on "The Purification of Water" was read at a recent meeting of the Junior Institution of Engineers by Mr. George H. Hughes, M.I.Mech.E., of Walton-on-the-Naze. The author dealt with the various processes in connection with modern methods, including preliminary treatment, sedimentation, screening, straining, settling, rough filtration, sterilising, and precipitation. He then went on to describe the three types of filters—gravitation, mechanical without chemicals, and mechanical with chemicals. Reference was then made to the system of filter cleaning by means of hydraulic ejectors, as adopted by the Metropolitan Water Board, in which the sand is lifted, removed, and partially washed en route to a rotary washer. In considering various filtering media the qualities of silicated carbon, dolerite, and coke were mentioned, and, passing on to water softening, the three usual processes—lime, soda, and a combination of the two—were discussed. On the subject of sterilisation the author recounted his experience in successfully applying copper sulphate in the treatment of a South African water which occasionally developed algæ. Such growth often occurred where circulation was imperfect; the Staines reservoir was instanced as an example, but with the aid of copper sulphate the oscillaria had been dispersed. The author considered an electrolytic hypochlorite solution to be the best remedy in such cases.

ARCHITECTURAL GRANITE.

(Concluded from p. 428, No. 692.)

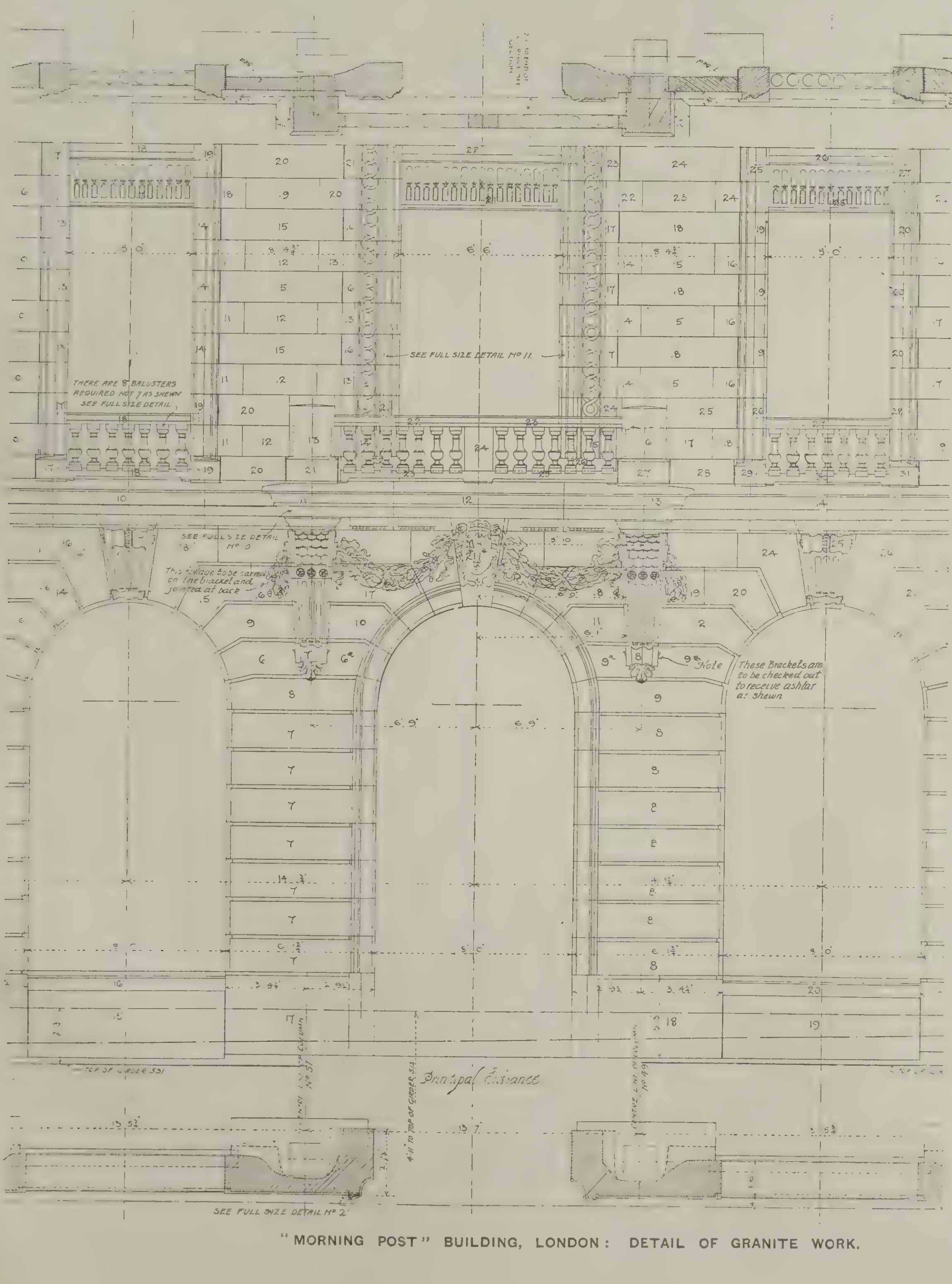
Drawings for Granite Work.

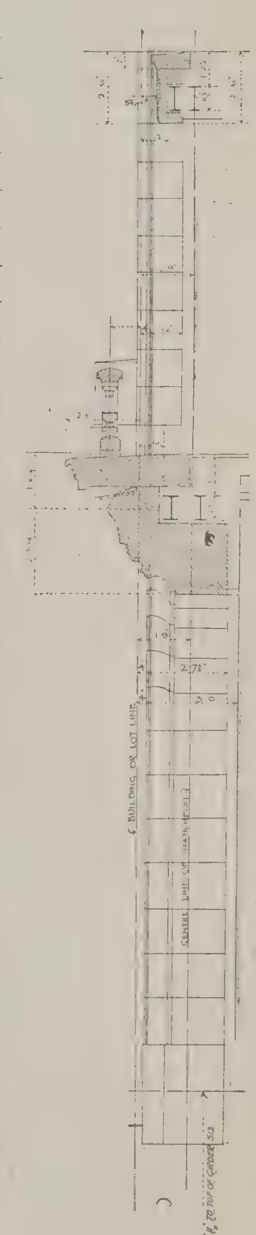
The preparation of detail drawing for granite work is a subject which needs careful consideration by architects, as the practice differs slightly from the way in which drawings are prepared for stonework. The difference lies generally in the fact that granite work must be much more carefully detailed than stonework. The tendency of recent years has been generally in the direction of more carefully detailing drawings and giving dimensions of every part. Formerly it was the custom to leave much of the setting out to the mason, and the architect left him to scale off the work from the drawings, upon which no dimensions were figured. The same thing applied to some extent to steelwork; the shop foreman and the template-maker were allowed to determine the position of rivets, and templates were prepared for nearly all the work, whereas nowadays it is becoming the custom to put every dimension on the drawings and to set them out full size on the work without any templates being prepared. Granite work needs to be detailed quite as accurately as steelwork, and the dimensions should in every case be given.

The preparation of the detail drawings for granite work may be undertaken either by the architect and his assistants, or by specialists in the employ of the sub-contractor for the granite work, as preferred. The latter is the course which will be most generally favoured, perhaps, as a considerable amount of special knowledge is required.

Herewith we give some illustrations of the "Morning Post" building, executed in Norwegian granite from the Bakke quarries, supplied by Messrs. A. and F. Manuelle. The illustrations show how drawings for granite work are detailed. Copies of these drawings were furnished to the quarry manager in Norway, and had to be exactly worked to, except that the backs of the blocks were, of course, only required to be left rough and the exact form was therefore to some extent left to the quarrymen, provided that the back was hollowed out to the approximate sizes shown, so as to allow blocks to fit around the stanchions.

This raises a point that should be noted, for much labour has been entailed by the stanchions being placed without any regard to their granite facing. If they had been set back a little more from the face





Section through Principal Entrance.

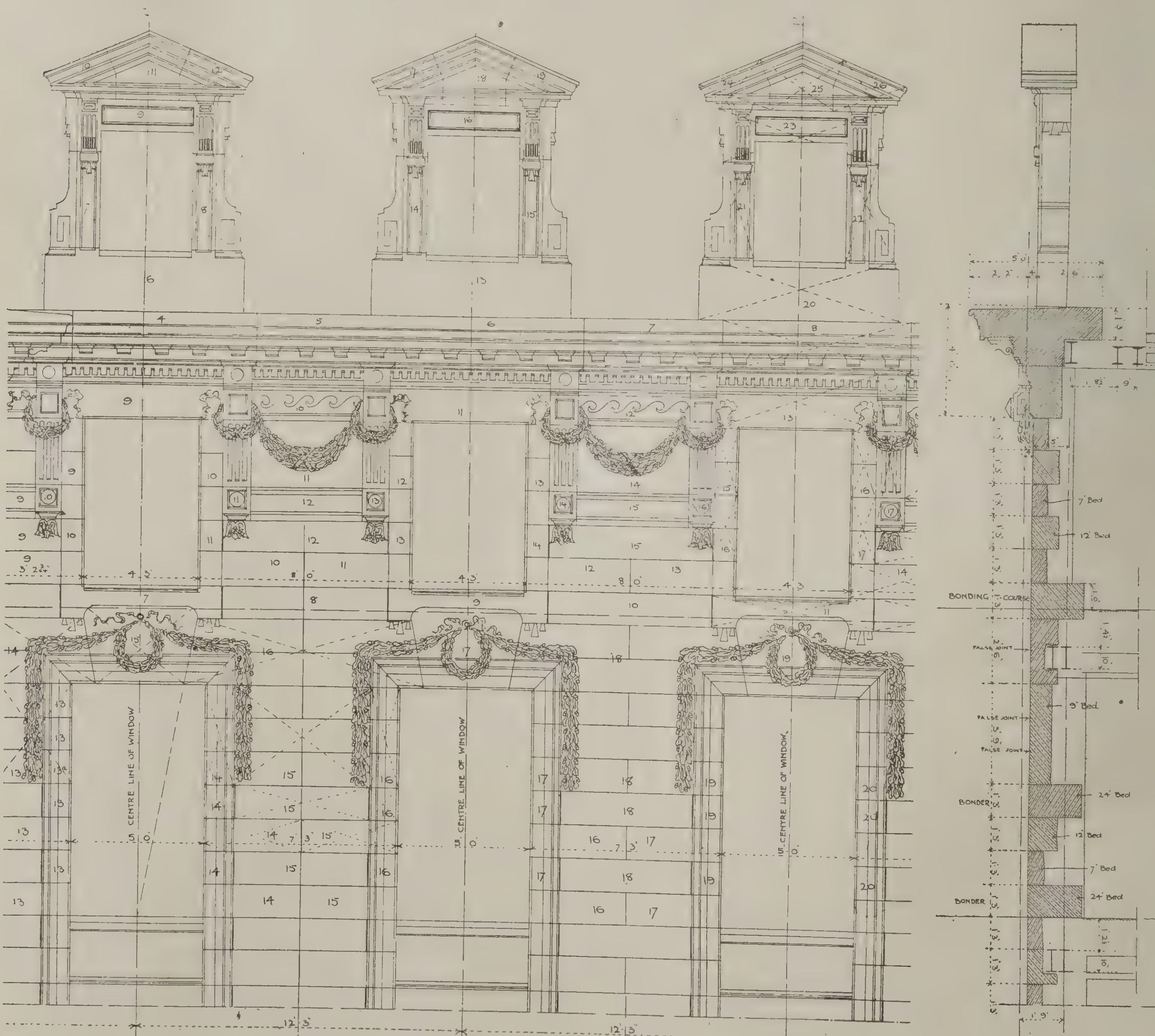
"MORNING POST" BUILDING, LONDON: DETAIL OF GRANITE WORK.

a great amount of labour might have been saved. It is, of course, becoming increasingly difficult in modern buildings to study such points, because the drawings for each part of the work are in the hands of specialists and are detailed separately. The drawings for the steelwork with a frame building, of course, have to be prepared in advance of the other drawings, and the granite work—or stonework for that matter—has to defer to the steelwork. In the case of the "Morning Post," the whole of the drawings for the granite work were carefully checked before being sent over to the Norwegian quarries, and although these were some considerable distance away from the site, no greater difficulty was experienced than there would be in having work executed in Aberdeen or Cornwall. Before the work left the quarry it was carefully inspected and checked several times with the drawings, and in the case of almost all portions of the building the granite work was fitted together as it would be on the job before the blocks were shipped.

Jointing.

The jointing of granite work is very similar to that of stonework. The only feature that need be noted is that in order

HEADS ON RITZ HOTEL COLONNADE, PICCADILLY, CARVED IN NORWEGIAN GRANITE.



Section.

"MORNING POST" BUILDING LONDON: DETAIL OF GRANITE WORK, UPPER PART OF ALDWYCH ELEVATION.

DETAIL OF CARVING IN NORWEGIAN GRANITE OVER ALDWYCH ENTRANCE TO "MORNING POST" BUILDING.

to secure fine jointing the beds in the stone are sometimes worked very slightly hollow—an expedient which, it has been found, was adopted by the Egyptians : it is sometimes advocated for columns, but as the blocks are often bedded on lead there is a danger of the base moulding being spalled off; it is therefore better to grind the beds of the blocks one on the other so as to get an exactly true bearing. Hollow bedding can be well applied to square blocks as long as the bed is not hollowed out too much, so as to risk spalling of the edges. In the Egyptian work the joints are so fine that it is sometimes impossible to get a knife between. The way in which these fine joints are obtained is for the beds of the blocks of granite to be worked hollow, as aforesaid, and then to be rubbed in position on each other, as advocated for columns. In the case of walling, this is unnecessarily exact and could only be done where a plentiful supply of labour was available and no regard paid to the cost.

Sculpture.

The accompanying details of sculpture on the "Morning Post" building, and on the new Ritz Hotel in Piccadilly show how suitable Norwegian granite is for fine carving. In the past, architects have looked upon granite as a material which was not capable of elaborate treatment, or at any rate supposed that the expense would be generally prohibitive. These examples prove the contrary. We have referred before to the manner in which the sculpture is economically executed by pneumatic tools.

Coloured Granites.

As regards the use of coloured granites for architectural work, particularly polished work, these have been used most extensively perhaps for public-houses. A great quantity of labradorite has, for instance, been used. Labradorite "granite"

DETAIL OF CARVING IN NORWEGIAN GRANITE OVER PRINCIPAL ENTRANCE TO "MORNING POST" BUILDING.

comes from Norway. It is a basalt consisting of felspar, pyroxene, magnetite and olivine, and therefore is not a true granite. It has a remarkable play of colours, due to the action of the felspar crystals in reflecting light. The rays in striking against these crystals interfere with one another when reflected, so that instead of getting any one colour we get interference, giving a peculiar lustre and iridescence. This is because the crystals contain minute particles of small impurities in the form of crystals arranged in close parallel lines. Two well-known qualities of labradorite are called "Emerald Pearl" and "Royal Blue." The weight of each is 168lbs. per cubic foot.

From Sweden we get a deep black granite and a rich red granite. Three of the best known varieties of the Swedish red granite are the "Bon Accord Red," "Carnation" and "Ruby Red." The weight per cubic foot of each variety is about 168lbs.

Coloured granites are also obtained in considerable variety from Switzerland and Italy, so that there are great possibilities in the material for decorative purposes. As but few marbles will stand use externally, the adoption of coloured granites provides the means of obtaining colour for external treatment, and the gradual increase in the varieties upon the market will therefore be regarded by architects as an advantage. It has been a general opinion that in order to display the colour of granite it must be polished, and the majority of buildings executed with coloured granites have had these polished, but for external purposes the polish is to be generally deprecated. This does not mean, however, that we are forced to abandon the use of coloured granites externally. It is true the colours are not so brilliantly displayed, except perhaps when the stone is wet, but coloured material should not be of too fiery a nature, and the softness of coloured granites when worked with a surface smooth, but not polished, affords a possibility of interesting and perhaps very beautiful treatment.

Granite is sometimes used externally in positions where there would not be any objection to its being polished: for instance, in the recesses of large doorways and entrance halls in offices and public buildings. The polished surface in such positions is not destructive of the appearance of strength, and it would be cleanly, as it could be washed down readily. The rich colours of granites might there be displayed to the utmost.

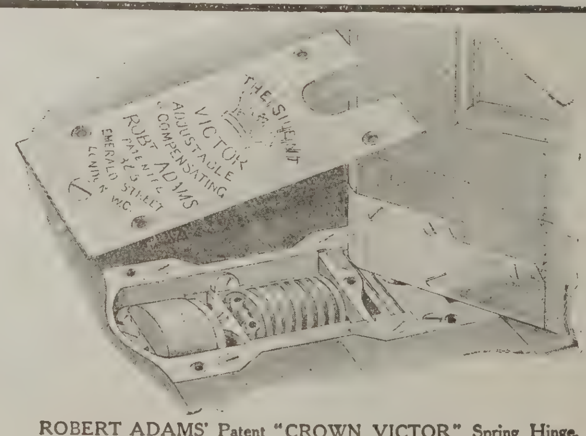
We publish on this page a view showing some columns in coloured granites, and also plinths, erected in the Liverpool Cotton Exchange. The columns are of the "Royal Blue" variety of Norwegian labradorite and the plinths, etc., in other parts of the work are of "Carnation," "Bon Accord" and "Ruby Red" varieties of Swedish granite, and also of the "Emerald Pearl" variety of Norwegian labradorite: the whole having a very rich effect.

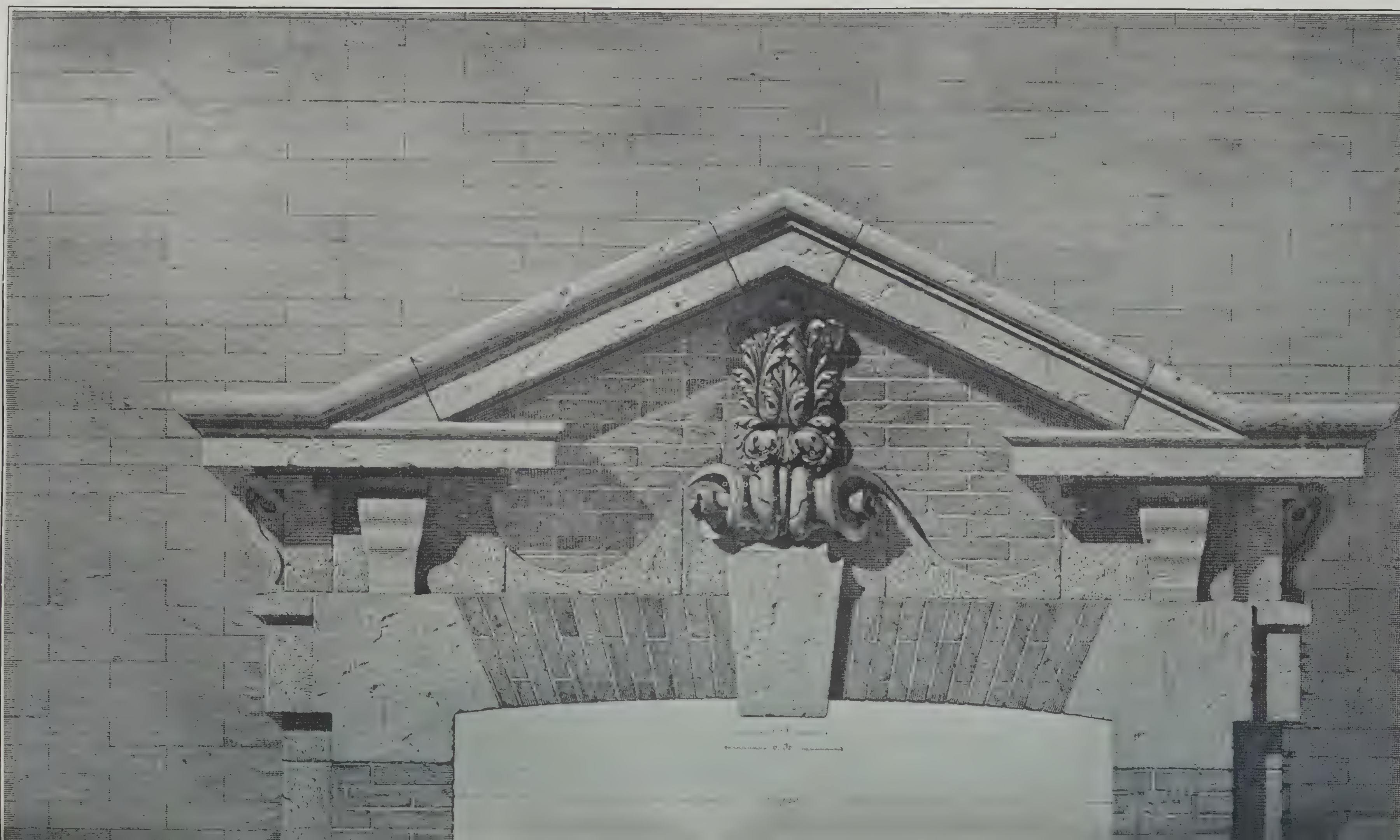
COLOURED NORWEGIAN GRANITE COLUMNS IN NEW COTTON EXCHANGE, LIVERPOOL.

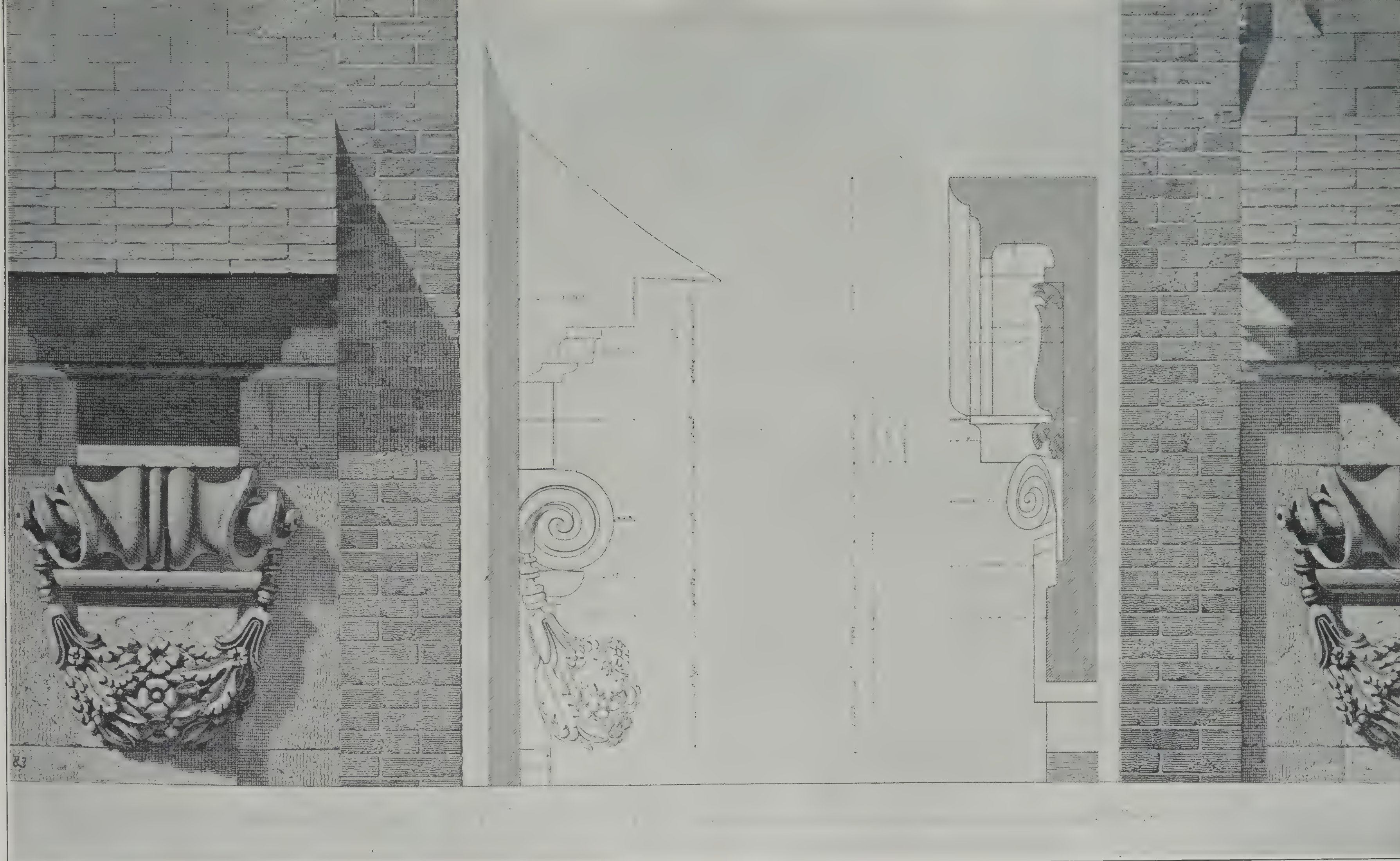
REBUILDING OR WIDENING OF KINGSTON BRIDGE.—The Joint Committee representing the County Councils of Middlesex and Surrey have resolved to recommend their respective Councils to promote a Bill in Parliament empowering them to reconstruct Kingston Bridge or widen it to 55ft. between the parapets.

* * *

AT THE WITHINGTON WORKHOUSE, West Didsbury, Manchester, where extensive alterations have been made under the direction of Messrs. Stott and Co., architects, "The Only" closets have been supplied by the Sanitary Appliances Syndicate, Ltd., of 68, Victoria Street, Westminster. The w.w.p. to each closet fills in 30 seconds on the upper floors, and in 15 to 30 seconds on the first and second floors, so that a fresh flush can be given in less than a minute.







FONTAINEBLEAU: DETAIL OF PEDIMENT, GALERIE DES CERFS.

June 17, 1908. Volume 28. No. 697.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

A Mistaken View of London as a City.

Under the appropriate title of "London Transformed," our contemporary the "Observer" recently published a well-intended, but, in our opinion, a far too optimistic forecast of the result to the metropolis of the many rebuilding schemes (numerically probably without parallel in its history), which have been carried out recently, or are now in course of realisation. We have no hesitation in saying we disagree *in toto* with the sanguine view expressed by the writer of the article, that progress is being made "towards the creation of a city which will be the grandest as well as the greatest in the world. More majestic as well as larger than Paris, and carrying into the mass and boldness of its newer edifices the spirit of its size." Whilst we are unable to admit that many of the new buildings to which the "Observer" refers in general laudatory terms, add appreciably to the architectural value of our streets, yet let us, for the moment, put this question aside, because, after all, the grandeur of a city is far more dependent upon the amount of study and care bestowed upon the planning of its streets and thoroughfares, and upon the amount of space at the disposal of its designer, than upon the architectural qualities of its buildings. With regard to London, it is well known that, after the great fire of 1666, the strong opposition of the citizens, who ardently desired to retain their old landmarks (many of which would have been swept away by the adoption of the proposal), caused the rejection of Wren's masterly plan for re-building the city. With the reconstruction of London on a plan based upon the retention of the old lines of streets, an opportunity of transforming the capital into one which, architecturally, might well have proved to be "the grandest city in the world," was lost for ever. There are, therefore, still in existence many of the narrow tortuous streets of the mediæval township, some of which rank to-day amongst the busiest thoroughfares of the city proper. And this unavoidable want of definiteness, coherence, and spaciousness in the planning of the heart of the city has re-acted, injuriously, upon later extensions. Many of the principal thoroughfares, thus added to the former boundaries of London, are already insufficient for the requirements of the ever-increasing army of city toilers, and the lack of adequate direct connections between important centres of traffic is only too obvious. For these, and many other reasons, London is not, and can never aspire to be, the "grandest city in the world." The ideal city is one in which the main streets assume the form of broad straight avenues, lined with shady trees, and having pavements for pedestrians and separate roadways for equestrians—one in which the subsidiary thoroughfares are, almost without exception, placed at right angles to the main arteries of the traffic—one in which a large proportion of the land is attractively laid out in the form of public gardens or parks, arranged in parterres and bosquets, planted with trees, embellished with fountains, basins, and statuary, and bright with flowers: in short, the fundamental essential of the ideal city may be described in one word—*space*. How is this desideratum to be obtained within the limits of the, relatively, restricted, area of our densely populated city? and if its attainment be impossible, surely it is idle (and not a little misleading to those members of the community who know little or nothing of the elements of city planning) to say that "London is claiming the full pride of precedence." Have we now, or are we likely to have in the future, metropolitan thoroughfares equal in magnificence, to say, the *Ringstrasse* of Vienna, the *Unter-den-Linde* of Berlin, the *Avenue des Champs Elysées* of Paris? And if we compare the public gardens and open spaces of London with those of the above-named and other Continental cities, are we not compelled to admit the humiliating fact that in no other capital are there to be seen such unutterably gloomy and ugly specimens of the "art" of the landscape-gardener as those which greet the jaded citizen in many of the squares in Bloomsbury, and even in other more fashionable parts of that London which is "already becoming more and more fascinating to those who are most widely acquainted with the world's cities?" Let us not deceive ourselves—Londoners have many fine and spacious parks, the possession of which is due, however, rather to accident than to design, as several of them were originally royal parks, and were thus preserved from the inroads of the builder; but, unfortunately, they do not form an integral part of the street planning. This being the case, our public gardens, although possibly in extent they equal or exceed those of some other cities, in which the thoroughfares and open spaces have been laid out simultaneously, can never appear to the same advantage, and they can never counteract to the extent that would be possible under other conditions of city planning, the meanness and, sometimes, positive ugliness of many of the London streets.

A Most Valuable Report.

A most valuable report on dry-rot was prepared by Mr. Paul Ogden, F.R.I.B.A., for use in the important action at law—*David Lewis Trust and Levy* v. *Graham*—tried at Manchester recently, in which damages were claimed from the architect of a building, because, two years after completion, it was found that some of the floors had become infested with dry-rot to such an extent that they had to be reconstructed. The case, which is obviously fraught with much significance for architects, was reported in our issue of May 6th. Mr. Ogden, in preparing his evidence, made a most conscientious and painstaking study of the subject, and seems to have consulted every available authority. A digest of the valuable information thus collected was published in the "Journal" of the Royal Institute of British Architects for June 6th. Mr. Ogden points out that while authorities usually assert that dry-rot is a state of decomposition of timber induced by fungi, of which the best known is *Merulius lachrymans*, it is important to recognise that *Polyporus vaporarius* destroys wood in a manner so similar to that of *Merulius* that possibly the ravages of the former are sometimes attributed to the latter. The chief point of distinction seems to be that the ribbons and strands formed by the mycelium of *Polyporus* are snowy white not grey like those of *Merulius*. A correct diagnosis might conceivably affect the issue as to an architect's responsibility, for while *Merulius* is a domestic fungus, peculiar to buildings, and not found in the forest, *Polyporus* is common in the forest, and its spores may lodge undetected in the cracks of barked logs. It is clear, therefore, that while the architect may be held responsible for the structural and other conditions that favour the propagation of *Merulius*, it would be much less easy to convict him of negligence where the mischief was caused by *Polyporus*, for it may be suspected that *Polyporus*, flourishing as it does in the forest, is not only less easy of detection than *Merulius*, but is also of more vigorous habit, and therefore may possibly prosper in spite of the architect's utmost precautions. This,

Photo: Ambler.

THE NEW ROYAL INFIRMARY, MANCHESTER: OXFORD ROAD FRONTAGE. EDWIN T. HALL, V.-P.R.I.B.A., AND JOHN BROOKE, F.R.I.B.A., JOINT ARCHITECTS.

This important new building is now well on the way to completion.

however, is merely our own suggestion, and perhaps Mr. Ogden would not care to endorse it. Conditions favourable to the germination of the spores of *Merulius* are the presence of an alkali such as ammonia, and the existence of a warm, still, damp atmosphere. The fungus is chiefly found in warm cellars, under unventilated wooden floors, or in basements, particularly in rooms where there are constant fires. The ends of timbers built into walls are almost certain to be affected by dry-rot unless they are protected by iron shoes, lead, or zinc, and woodwork affixed to walls before they are dry is equally liable to become infected. Impervious floor-coverings favour decay by preventing access of air, and by retaining dampness, and painting or tarring newly-cut or unseasoned timber has the same effect. The mischief spreads with alarming facility. Strands of mycelium pass from diseased wood across intervening brickwork or soil and on to sound timber; and the spores, which are extremely minute and light, can be carried from house to house on the clothes and tools of workmen; the teeth of saws being especially prolific of infection. The great safeguard, beyond taking care that no spores of mycelium are present from the first, is to arrange that all the brickwork, floors, etc., shall be thoroughly dry before the timber is put in contact with them. Then it is necessary to provide for the ventilation of the timber, for "dry timber kept dry is proof against dry-rot." The eradication of dry-rot depends upon the thoroughness with which every particle can be removed. Where cutting and scraping, and suchlike operations, are impracticable, a less certain remedy is that of soaking the diseased wood with corrosive sublimate, dissolved in methyl alcohol, which has the disadvantage of being highly inflammable. Carbolic acid or a strong solution of copper sulphate may be substituted, but it is evident that these washes only kill the particles with which they come into immediate contact, and that the deeper-seated hyphæ that they fail to reach will flourish in spite of them. One important word of caution is that chips left lying under a floor are almost certain to become infected, and Mr. Ogden thinks "that it would be well if architects insisted in their specifications on every chip being cleared away below boarded floors." Even this brief summary may serve to indicate the value and importance of Mr. Ogden's contribution to a subject that is still, however, but imperfectly understood.

The Secret of the Sphinx Revealed.

Until recently—to be precise, until the publication last week of the report of the proceedings of the Spiritist Congress—it has been assumed, erroneously, as it now appears, that the sole recipient of the secret of the wonderful construction and mechanical skill of the early Egyptians was that mysterious being with the head of a man and the body of a lion, known to the Arabs as the "Father of Terror." Among the architectural achievements of the Egyptians, the Pyramids, for ages past, have held the pride of place. Lénormant describes them as "the most prodigious of all human constructions," and they were regarded by Greece and Rome as among the seven wonders of the world. Historians of all ages and of all countries, from Herodotus to James Fergusson, have felt and expressed the warmest admiration for the vast amount of skill displayed in their construction, skill which enabled these Egyptian builders to pile, one over the other, blocks of granite weighing more than fifty tons, some over thirty feet in length, and all so well set and fitted that the joints are scarcely perceptible. By what means the Egyptians were enabled to deal with these immense blocks of granite, which a modern engineer would hesitate to handle, has long been a mystery. But the secret has now been revealed, for at the meeting of the congress held in Paris on June 11th M. Bose announced to an awe-struck and sympathetic audience, that the superposition of the granite blocks of the Pyramids was effected by the combined *wills* of the assembled thousands acting under the control of adepts in their midst, and of priests in the adjoining temples, whose ruins are always close to these monumental piles. In short, the early Egyptians were masters of the art of levitation. We are pleased to be able to draw our readers' attention to this profound and scholarlike solution of a much-debated problem, and incidentally, with this glorious result of a congress fresh in our minds, we take the opportunity of expressing our regret at having recently published some rather disparaging remarks concerning congresses in general.

The 13th Thames Tunnel.

The Rotherhithe-Stepney Tunnel, which was opened on Friday last by the Prince of Wales, connects Rotherhithe on the south side of the Thames with Stepney on the north side, and is the thirteenth tunnel under the Thames. Of this series, the first in date of construction is the Thames Tunnel, which was begun by Brunel in 1823, and not completed until 1843, this period of twenty years including seven years of inactivity. This tunnel, which cost rather more than £600,000, is now used by the East London Railway. The other tunnels are—the Tower Subway, four tunnels of the City and South London Railway, two tunnels of the Waterloo and City Railway, two of the Baker Street and Waterloo Railway, the Greenwich Tunnel, and the Blackwall Tunnel. The Rotherhithe-Stepney Tunnel is, including approaches, 6,883ft. long, and is the largest that has ever been driven on

the shield system, the shield used having been 30ft. 8ins. in diameter and 13ft. long. The tunnel has an outside diameter of 30ft., and an inside diameter of 27ft., and in the middle of the road there is a clear headway of 18ft. 6ins. The roadway is 16ft. wide throughout, and the footways vary in width from 4ft. 8ins. in the tunnel to 6ft. elsewhere. The greatest depth below ground-level is about 75ft. The tunnel approach on the south bank extends for a distance of 934ft., and in this section it was necessary to carry the new highway over the East London Railway at Rotherhithe Station. This necessitated the cutting away of the crown of the tunnel and the building of new retaining walls and a girder bridge. A length of 540ft., cut-and-cover work, carries the new road to the mouth of the land tunnel, 890ft. long, and this is followed by the under-river tunnel, which has a length of 1,535ft. On the north side of the river there is a land tunnel of 1,155ft., 600ft. of cut-and-cover work, and 1,186ft. of open approach. With a view to obtaining easy gradients, the steepest being 1 in 36, the tunnel is built on the slant. There is 1,122ft. of brick tunnel and 3,581ft. of iron-lined tunnel actually beneath the river. The gradient of the approaches is 1 in 37, and in order to secure this a curved course had to be taken. The work, in the hands of the contractors, Messrs. Price and Reeves, and under the supervision of the chief engineer to the London County Council, Mr. Maurice Fitzmaurice, has been carried out with remarkable rapidity, the tunnel being completed some 16 months in advance of contract time. This is due in large measure to the very complete character of the plant employed, and also to the fact that from the day the work commenced it was proceeded with day and night without intermission, Sundays included. Another circumstance which facilitated operations was the decision of the contractors to drive a small pilot tunnel of the dimensions of the ordinary tube railway in advance of the main tunnel. This not only enabled the strata to be tested, but the fact that the pilot tunnel was driven near the top of the permanent tunnel enabled a decision to be made as to the pressure the 7ft. of ground between the bed of the river and the top of the tunnel would withstand. It thus became possible to regulate the pressure in the working chamber by gauges to meet the varying conditions arising from the rise and fall of the tide. There were very few cases of caisson disease during the progress of the work, and no serious accident occurred to the workmen. The cost of the tunnel is stated at about one million pounds sterling, the cost of purchasing the property to permit of the approaches being estimated at another million.

Holborn's Decorative Ideals.

The unsatisfactory character of our street decorations on State or stated occasions has called forth a protest and a suggestion from Mr. Lionel Walford, the town clerk of Holborn, who claims that the committee charged with the responsibility of decorating the streets in that borough "fully appreciates the unsatisfactory results achieved by putting up tawdry paper garlands and rickety Venetian masts." To decorate after this fashion is, he declares, "to destroy the great beauty of our streets." One does not quite know whether to attribute the discovery of this "great beauty" to Mr. Walford's local patriotism or to the exuberance of his imagination. Let it be granted, however, that Holborn has anticipated the æsthetic amenities of the Town Planning Bill. It is not the less difficult to share Mr. Walford's enthusiasm for the decorative scheme on which he pins his faith. His committee "take the view that, if any decoration is to be done, it should be of the simplest and most dignified character, harmonising with rather than hiding the masonry of the buildings." As an abstract proposition, that is surely quite unexceptionable, and the cautious clause, "if any decoration is to be done," is entirely admirable; but, as the immortal Captain Bunsby was wont to remark, "the bearings of this observation lays in the application on it," and the Holborn application of the principles formulated is hardly inspiring as a demonstration of dignity and harmony. With the object of attaining to these refinements, "the decorations in Holborn recently consisted only of plain lines of clean bunting stretched across the streets from window to window. The flags used are large and rectangular, and the result is a vista of great beauty, and, if I may say so, is thoroughly English." To which we would add that Holborn's pure and lofty ideals might perhaps come nearer to complete realisation if a capable architect were consulted as to the best means of reconciling practice with theory.

Some Inigo Jones Panelling.

In an old farmhouse in Bedfordshire there has been found some wood panelling of a room which is ascribed to Inigo Jones, having presumably been removed from a neighbouring hall which he is known to have designed. The woodwork, which is now in London—at Messrs. Hindley and Wilkinson's, 8, New Bond Street, W.—is in an excellent state of preservation. Pilasters run from the floor to the under side of the entablature and cornice which surround the room at the ceiling level. The original doorways were concealed in the wainscot, but as at present erected some niches at each end of the room, the use of which it has not been possible to discover, have been converted into doorways. It seems probable that they were originally designed as such, and were altered when the panelling was removed to the farmhouse.

THE NEW CANADA GATES IN CONNECTION WITH THE NATIONAL MEMORIAL TO QUEEN VICTORIA IN FRONT OF BUCKINGHAM PALACE, LONDON.

These fine gates, recently completed, lead out through the Green Park towards Piccadilly. They are of forged iron, with cast-bronze enrichments, gilded; the whole of the sculptor's work, modelling, &c., and the foundry work and smithing having been executed in the studios and workshops of the Bromsgrove Guild of Applied Arts, at Bromsgrove, Worcestershire. For the above view we are indebted to our contemporary the "Morning Leader."

IN PARLIAMENT.

(By our Press Gallery Representative.)

Building Accident Regulations.

In reply to a question relative to the draft regulations for building accidents, Mr. Gladstone said that legislation would be required to give effect to such regulations, and he hoped to introduce a Bill very soon which he trusted would not be contentious.

Later, Mr. Richardson asked the Home Secretary whether his attention had been called to the fact that on May 18th last John Power, a bricklayer's labourer, whilst engaged in building operations in connection with the Nottingham Hippodrome, lost his life by falling when wheeling a barrow-load of mortar on a scaffold 40ft. high; whether his attention had been called to the suggestion of the Builders' Labourers' Trade Society of a guard placed at the edge of a scaffold to prevent such accidents; and would he take such measures as should prevent similar accidents in future.

Mr. Gladstone, in reply, said the inquest on this accident was attended by the factory inspector, and he had received a report with regard to it. It appeared that the platform was guarded by a fence 1ft. 9ins. high, but the barrow which the deceased was wheeling came into collision with a stay and the shock caused him to fall over the edge. Evidence was given by the Secretary of the Nottingham Builders' Society to the effect mentioned in the question before the recent Departmental Committee, and the Committee made a recommendation on the subject.

Proposed New Science Museum.

Sir W. Anson asked the President of the Board of Trade whether, having regard to the insufficiency of the present temporary buildings at South Kensington for the housing and display of the collections of scientific instruments and apparatus belonging to the Government, he would consider the advisability of erecting a suitable building for a science museum on the site of the existing temporary galleries.

Mr. Runciman, in reply, said: "I think it would be eminently desirable that there should be a science museum properly housed in immediate propinquity to the Imperial College of Science and Technology, and if the Commissioners of the 1851 Exhibition feel themselves in a position to co-operate I should be happy to bring the matter under the notice of the Chancellor of the Exchequer; but it is obvious that any step requiring the financial assistance of the Government could only be undertaken with due regard to the general calls upon the Exchequer."

Notes on Competitions.

New Schools, Bridlington.

The design of Mr. Joseph Earnshaw, of Bridlington, has been selected for this school, which is to accommodate 500 scholars.

Church Buildings, Blackheath, for Use as an Elementary School, etc.

In this limited competition, the report of the assessor, Mr. Philip A. Robson, A.R.I.B.A., has been adopted by the committee, and Messrs. Wills and Anderson, of Bloomsbury Square, W.C., the authors of the design placed first, have been appointed architects for the work.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
July 13	EXTENSIONS TO WORKHOUSE BUILDINGS, DUDLEY.—Limited to architects practising within 35 miles of Dudley. Conditions from G. W. Coster, Clerk, Union Offices, St. James's Road, Dudley.
July 31	ELEMENTARY SCHOOL AT BANBURY.—Conditions from Oliver J. Stockton, Town Clerk, Banbury. Deposit £1.
Aug. 1	COUNTY HOSPITAL, GUERNSEY.—Conditions from Thomas Robin, President of Directors of Hospital, St. Peter Port, Guernsey.
Aug. 31	PARISH CHURCH AT BISHOPSWEARMOUTH.—Limited to Sunderland architects. Conditions from H. E. Hinckley, 68, Cleveland Road, Sunderland. Deposit one guinea.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Con-ditions from the Secrétariat de l'Association du Monument de la Réformation, 56, Rue du Stand, Geneva.
No date.	SITE PLAN FOR COTTAGE EXHIBITION, SWANSEA, 1909.—Gold, silver and bronze medals, with prizes of £25, £15 and £10. Particulars from Henry R. Aldridge, 7, Gower Street, Swansea.
No date.	NATIONAL LIBRARY BUILDINGS, ABERYSTWYTH.—Architects desirous of competing should send designs and photographs of libraries, or similar buildings erected under their direction, to J. E. Davies, Hon. Secretary, National Library of Wales. Aberystwyth.

THE BUILDING ACCIDENT REGULATIONS.

In connection with the draft regulations drawn up by the Building Accidents Committee—already dealt with in our columns—certain modifications have been put forward in order to bring the regulations into line with the Scotch system of scaffolding, and steps will be taken to bring these amendments under the notice of the Home Secretary. The clauses in which the suggested alterations occur are as follows:—

As existing.	*As amended.*
PART I. Duties of Employers.	PART I. Duties of Employers.
2. Sufficient material shall be provided for, and shall be used in the construction of scaffolds, and when in place shall not be removed until the part to be removed is no longer required for working purposes, stability, or safety.	2. Sufficient material shall be provided for, and shall be used in the construction of scaffolds, to secure stability and safety.
3. Pole standards shall not be fixed more than 10ft. apart, etc.	3. Pole standards, when used in masonry, bricklaying, or other heavy work, shall not be fixed more than 10 ft. apart, etc.
4. Working platforms of pole, frame, gabbard or trestle scaffolds shall be closely boarded or planked, etc.	4. Working platforms of pole, frame, gabbard or trestle scaffolds, when used in masonry, bricklaying, or other heavy work, shall be closely boarded or planked, etc.
14. Every working platform more than 12 ft. above the ground, gantry, or floor shall be provided, etc.	14. Every working platform more than 15 ft. above the ground, gantry, or floor level shall, where not exceeding 45 ins. wide, be provided, etc.
18. The working platform of outside scaffolding nearest the eaves shall remain in position until the carpenters, slaters, tilers, plumbers, and other workmen have completed their work on the roof, and a section of the scaffold shall be left at any part of the building at which plumbers have work to do, unless a scaffold is erected for their use.	18. The working platform of outside scaffolding nearest the eaves shall remain in position until the carpenters, slaters, tilers, plumbers, and other workmen have completed their work on the roof, and a section of the scaffold shall be left at any part of the building at which plumbers have work to do, unless a scaffold is erected for their use.
19. For work on the roof of a new building, or where there is extensive repair on a roof and there is no pole or other scaffolding, or parapet wall, there shall be constructed a jib or cantilever scaffold not more than 30 ins. below the eaves, with a platform at least 45 ins. in width, with proper guard rails and guard boards.	19. For work on the roof of a new building, or where there is extensive repair on a roof and there is no pole or other scaffolding, or parapet wall, there shall be constructed a jib or cantilever scaffold at a suitable distance below the eaves, with a platform at least 30 ins. in width, with proper guard rails and guard boards. Note: Clauses 18 and 19 shall not apply to flat roofs, nor to roofs having slopes under 40 degs., nor to buildings not exceeding 15 ft. in height to wall-head.
21. Every working platform erected on trestles (except painters' trestles) shall, etc. . . . The boards forming working platforms for internal work for the use of plasterers and painters shall not be spaced more than 7 ins. apart.	21. Every working platform erected on trestles, for use in masonry, bricklaying, or other heavy work (except painters' trestles) shall, etc. . . . The boards forming working platforms for internal work for the use of plasterers, painters, and tradesmen engaged in light work shall not be spaced more than 12 ins. apart.
23. Figure or bracket scaffolds. . . . . The working platforms shall not be less than four $6\frac{1}{2}$ in. by $2\frac{1}{2}$ in. planks wide, etc.	23. Figure or bracket scaffolds. . . . . The working platforms shall not be less than three $6\frac{1}{2}$ in. by $2\frac{1}{2}$ in. planks wide, etc.
24. Planks supported by ladders, steps, or folding trestles, shall not be less than 9 ins. wide and $1\frac{1}{2}$ ins. thick, and shall not exceed 9ft. bearing	24. Single planks supported by ladders, steps, or folding trestles, shall not be less than 9 ins. wide and $1\frac{1}{2}$ins. thick, and shall not exceed 9 ft. bearing. Two battens may be used, $2\frac{1}{2}$ ins. thick, in which case the bearing shall not exceed 12 ft. . . . .
25. Ladders . . . shall rise at least 6 ft. above the place to which they give access . . . and if of more than 40 rungs shall be stayed in the centre of length. . . . Ladders made from sawn timber shall not be used unless of adequate strength, etc.	25. Ladders . . . shall rise at least 4 ft. above the platform or landing to which they give access. . . . All ladders shall be of adequate strength, etc.
27. Each floor of the building below which workmen work or pass shall be covered in, etc.	27. The floor of the building below which workmen work or pass shall be covered in, etc.
28 (Cranes). . . . The platforms for the driver and the signalman shall be of sufficient area, close-planked, securely fenced, and provided with safe means of access.	28 (Cranes). . . . The platforms for the driver and the signalman shall be of sufficient area, close-planked, and provided with safe means of access. They shall be securely fenced where exceeding 15 ft. in height.
34. Boxes used for hoisting bricks or other loose material shall be closed in on the four sides.	34. Boxes used for hoisting bricks or other loose material shall be closed in on not less than three sides.
38. In all excavations, except in rock, necessary timber struts . . . shall be provided, etc.	38. In all excavations exceeding 4 ft. in depth, except in rock, blaize, strong clay, or similar material, necessary timber struts . . . shall be provided, etc.
39. Washing conveniences shall be provided for the use of painters and plumbers, with a sufficient supply of water, soap, nail brushes and towels, etc.	39. Washing conveniences shall be provided for the use of painters and plumbers, with a sufficient supply of water, soap, etc.
PART II. Duties of Workmen.	PART II. Duties of Workmen.
44. They shall not be carried by the cranes or ride in barrow hoists, or hod hoists, or adopt other unsafe means of getting about the building, but shall use the gangways, ladders, or staircases provided for the purpose.	44. They shall not be carried by the cranes or ride in barrow hoists, or hod hoists, or adopt other unsafe means of getting about the building, or other place of work, but shall use the gangways, ladders, or staircases provided for the purpose. They shall keep clear of any load in course of being raised or lowered by crane, hoist, or other appliance.

THE LONDON ASSOCIATION OF MASTER DECORATORS.

This new Association has now been founded, a meeting having been held at the Holborn Restaurant on June 1st to adopt the rules and to appoint officers. Mr. John Anderson, of Kensington, chairman of the provisional committee nominated to deal with the initial matters of the proposed Association, said they had given much consideration to the name, and had come to the conclusion that the title "Master Decorators" was comprehensive, and included the allied trades which were associated with the name in the London area. They did not wish to clash with any existing organisations or societies, but he and those associated with him felt that their interests were often sacrificed for want of a body such as they were now organising. Suggestions had been made that they should amalgamate with another society, but he thought that the time was not ripe for that. It was part of their programme to affiliate with the National Association of Master Painters of England and Wales, who would bring their influence to bear on all trade questions.

Election of Officers.

Mr. H. A. Campbell, of Messrs. Campbell, Smith and Co., Newman Street, W., was elected as the first president of the Association, Mr. John Anderson vice-president, Mr. Alexander Davidson, of 21, Finsbury Pavement, secretary, and Mr. J. J. Honeychurch, of Notting Hill, treasurer.

Mr. Campbell said he wanted to see a strong Association formed, so that they might effectually deal with those matters referred to by Mr. Anderson. In addition to the question of discounts, there were other matters which needed most earnest consideration. He would like to see some restriction put upon the custom of supplying designs, whereby firms were often put to great trouble and expense without any consideration of cost. They must try and induce every good firm in the metropolitan area to come into their Association. He had received a letter from the president of the Incorporated Institute of British Decorators, who had suggested that they should amalgamate their forces. (The president read the letter, and, after some considerable discussion, it was decided that at present they must adhere to the original programme, and the question of amalgamation must be left over.)

Mr. Frank Stuart Murray, who attended on the invitation of the president, expressed himself cordially in sympathy with the objects of the Association. He spoke as an architect, and as a member of the Incorporated Institute of British Decorators. The decorator's craft, he said, was of a high technical order, requiring skill and long training, and was specially exposed to injury from the

Irregular and Severe Competition

initiated by the departments of large general trading companies. The time was ripe for some attempt to be made to control the abuse of the system of free designs and estimate, which had grown to such an extent as to seriously impair the legitimate profits of business. Mr. Murray quoted a case in which the total value of the designs and costs of preparing estimates submitted by different firms in a competition must have amounted to at least one-fourth of the value of the contract. The abuse of the discount system by private and professional persons also called for remedy. It was a delicate subject, but every tradesman was aware of the evil, and longed for some honest and definite action by leading firms. Mr. Murray was quite sure that the architectural profession would heartily welcome any organisation that endeavoured to raise the status of a craft with which they were so closely in touch. In conclusion, he said that the formation of this Association was a marked progress in the right direction (the direction of effective control, and of a recognised code of honourable trading), but that the ultimate goal should be the incorporation of all the Associations with the ancient and historic Company of Painters of the City of London. That would ensure them a tradition and position as inheritors of the Ancient Guild, and they would bring to that body a freshness and vitality which would place the Company in a unique position among the great City Companies.

Law Case.

IMPORTANT POINT IN WORKMEN'S COMPENSATION.—In the Court of Appeal recently the case of *Andrews* v. *Andrews and Mears* involved a point of considerable importance under the Workmen's Compensation Act. The appeal was from an award of the Judge of the Marylebone County Court in favour of the widow and children of a deceased workman. It appeared that Mears was a builder and contractor, who in August last had a contract to do certain work in connection with a paving job near the Albert Hall, Knightsbridge. The work consisted of carting sand to Knightsbridge, and carting rubbish away from the job to a shoot which Mears had at Stamford Green. There was a sub-contract between Mears and Henry Allen Andrews, under which Andrews carted rubbish from the Albert Hall, and was at liberty to tip it wherever he liked. On August 16th, 1907, John Andrews, a son of Henry Allen Andrews, who was in his father's employment, was carting rubbish from the Albert Hall. He was not taking it to Mears's shoot, but to St. Quintin's Avenue. In the course of the journey he went to sleep, and fell from the cart. The wheel went over his neck and killed him. The place where the accident occurred was about two miles from the Albert Hall. In these circumstances the learned County Court Judge held that Henry Allen Andrews, as employer, was liable to pay compensation to the dependants of John Andrews for the injury resulting to them from his death. He also held that Mears was liable to pay compensation as "the principal" within sub-section 1 of Section 4 of the Workmen's Compensation Act, 1906, and that the work of carting was to be executed, not only at the termini from and to which the materials were to be carted, but also on the roads between those termini along which the materials were to be carted, and that consequently the accident occurred on premises on which Mears had undertaken to execute the work in the course of which the accident occurred. His Honour accordingly ordered that both

H. R. AND B. A. POULTER, ARCHITECTS. *(Royal Academy Exhibition, 1908.)*

Henry Allen Andrews and Mears should pay compensation, and that Andrews should indemnify Mears. Mears appealed. The Court allowed the appeal. The Master of the Rolls said that it obviously would not do to hold the principal liable for every accident which might occur to a workman who was not employed by him, so in sub-section 4 of section 4 of the Workmen's Compensation Act, 1906, which was the section which imposed the additional liability in favour of the workman as against the principal, there was this proviso:—"This section shall not apply in any case where the accident occurred elsewhere than on, or in, or about premises on which the principal has undertaken to execute the work, or which are otherwise under his control or management." In the present case the Court was asked to hold that the accident occurred on, or in, or about premises on which Mears had undertaken to execute the work, or which were otherwise under his control or management. His Lordship could not see how that could be supported. The learned County Court Judge had stated that it was part of the contract that the rubbish should be shot at particular places. That was not in accordance with the evidence, which was that it might be shot anywhere, but in any case to say that any portion of the roads radiating from the Albert Hall and going to any distance over which the subcontractor might be minded to take his cart was premises on which the principal had undertaken to execute the work, or which were otherwise under his control or management, seemed wholly unnatural and unjustifiable. The appeal must be allowed. The Lords Justices delivered judgments to the same effect.

Franco-British Exhibition: Summons for Surveyor's Fees.—At the West London police-court recently, Mr. A. H. Wharton Glasson, district surveyor for Hammersmith, sued the Franco-British Exhibition, Incorporated, in respect of a claim for £140 1s. 3d., as fees for surveying a building at the Exhibition called the Agricultural Hall. Mr. Horace Avory, K.C., who appeared for Mr. Glasson, stated that the claim was made under section 154 of the London Building Act, wherein it was laid down that the surveyor's fees were payable in the first instance by the builders, and in default of payment by them, by the owners. In this case the builders of the Agricultural Hall—Messrs. Findlay and Co.—wrote to the surveyor definitely refusing to pay the fees, so Mr. Glasson was obliged to sue the Exhibition Corporation. It appeared that there was a dispute between the builders and the owners in this case, and on May 8th the Corporation wrote to Mr. Glasson that the matter must be decided in the law courts. For the defence, Mr. Broxholm contended that the section of the Act was only intended to be applied in a case where a builder became insolvent, and not, as in the present case, where the builders were people in a large way of business, well able to meet all their obligations. Moreover, two other contractors, beside Findlay and Co., were engaged in the erection of this building, and they had not been asked to pay the fees.—The magistrate inquired if it was the surveyor's duty to present a bill for his fees to each of the three builders.—Mr. Broxholm: Yes, sir; each of these builders helped in the construction—one did the ironwork, another the concrete, and so on.—Mr. Avory: Should the total bill be presented to each builder?—Mr. Broxholm: Yes.—Mr. Avory: And who is to decide which should pay?—Mr. Broxholm: They must settle that amongst themselves.—Mr. Avory pointed out that Findlay and Co. put up the ironwork, and they were therefore the builders; the others put in the concrete part of the building. Moreover, under the contract between the Corporation and the contractors, the latter were held responsible for all such charges as surveyor's fees, etc. — The magistrate decided in favour of the plaintiff, and made an order on the defendant Corporation for the payment of the sum claimed, together with £25.

Our Plate.

Fontainebleau: Detail of Pediment, Galerie des Cerfs.

This is another of the series of illustrations of Fontainebleau which have appeared in our centre-plates from time to time during the past year. The detail does not call for extended notice, as the illustration is self-explanatory. The pediment shown is one of a number on the elevation of the *Galerie des Cerfs*, breaking against the roof line. It is a refined example of the early Renaissance in France, and offers many suggestions to the architect of to-day.

Notes and News.

The New West Front to Hereford Cathedral was dedicated last week. The total cost has been £15,000. Mr. J. Oldrid Scott, F.R.I.B.A., F.S.A., was the architect, and Messrs. John Thompson and Co., of Peterborough, were the contractors for the work. The style is 14th-century Decorated, carried out in Hollington stone.

* * *

A Protest Against the Importation of Joinery has been lodged with Long Eaton District Council by the local carpenters and joiners, who referred specially to the arrival from Germany of sixteen railway wagon loads of finished joinery and other material for the temporary secondary school which is being built near the free library. Mr. George A. Perks, one of the largest contractors of the town, pointed out that he had machinery and men idle, but had not even had an opportunity of tendering for the work.

* * *

Edinburgh Bricklayers' Wages: Arbitrator's Award.—Mr. W. T. Oldrieve, acting as arbitrator in the dispute between the Master Brickbuilders' Association and the Operative Bricklayers' Society, in Edinburgh, took into consideration the following points:—(a) employment, (b) trade prospects, (c) comparison of labour rates with other skilled trades. Mr. Oldrieve finds that (a) as regard the state of the labour market at the date of the commencement of the strike, as compared with the date when the last agreement was signed, it appears that the percentage of bricklayers employed in the Edinburgh district was distinctly higher than when the agreement was signed. (b) In his opinion, the prospects of the bricklaying trade were, at the date of the commencement of the strike, in no better condition than when the agreement was signed. (c) A comparison of labour rates shows that bricklayers already receive a higher rate of wages than other skilled tradesmen in the building trade of Edinburgh district, and that the bricklayers' rate of wages bears a higher proportion in Edinburgh to other skilled trades than in Glasgow or Aberdeen. After carefully weighing all the facts of the case, Mr. Oldrieve decides that the future rate of wages for operative bricklayers in the Edinburgh district shall be 9½d. per hour.

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.
The querist's name and address must always be given, not necessarily for publication.

Planning Flats.

Aberdare.—Set Square writes: "Please supply information as to the planning of flats—that is, as to general requirements, cost per cubic foot, arrangement of rooms, etc. Are there any cheap books on the planning of flats?"

It is impossible to answer satisfactorily so complex a question through the medium of these correspondence columns, especially in view of the extremely scanty particulars given. The desired information will be found in "Residential Flats of All Classes," by Sidney Perks; 21s. net.; published by B. T. Batsford, 94, High Holborn, W.C. G.

Mastic Cements for Fixing Tiles.

Edgbaston.—V.T.W writes: "Please supply information as to mastic cements suitable for fixing tiles outdoors in a very damp situation."

Mastic cement can be obtained from the Associated Portland Cement Manufacturers, or it can be made—according to Millar, in his book on "Plastering"—by mixing 60 parts of slaked lime, 35 parts of fine sand, and 3 parts of litharge, kneaded into a stiff mass with 7 to 10 parts of linseed oil. Mastic cement is impervious to damp, and is unaffected by atmospheric changes. Portland cement has to a great extent superseded mastic. T. P.

Disinfectants.

Verge writes: "What value has permanganate of potash as a disinfectant, or germicide? If useful for that purpose, in what proportion should it be mixed with water for flushing drains and w.c.'s?"

The efficiency of permanganate of potash as a germicide is about equal to distilled water. There has lately been much controversy over the subject of disinfectants, for so many are advertised which have practically little or no value beyond a pleasant smell. Several well-known analytical chemists have devoted their attention to the scientific investigation of this matter. Roughly speaking, disinfectants may be divided into three classes:—Oxidising agents which oxidize and partly neutralise the ill-effects of harmful matters; Deodorants, which merely mask unpleasant smells; and Germicides, which actually kill the microbes. The test now usually imposed is that of the Rideal-Walker method, by which the power of a disinfectant or germicide to kill the typhoid bacillus is measured against the power of carbolic acid to kill the typhoid bacillus, the test being conducted under certain specified conditions.

Obituary.

Mr. Alfred Weller, borough surveyor of Brighton, died last week, aged 60. He had been associated with the corporation since 1866, and had occupied the position of surveyor for three years.

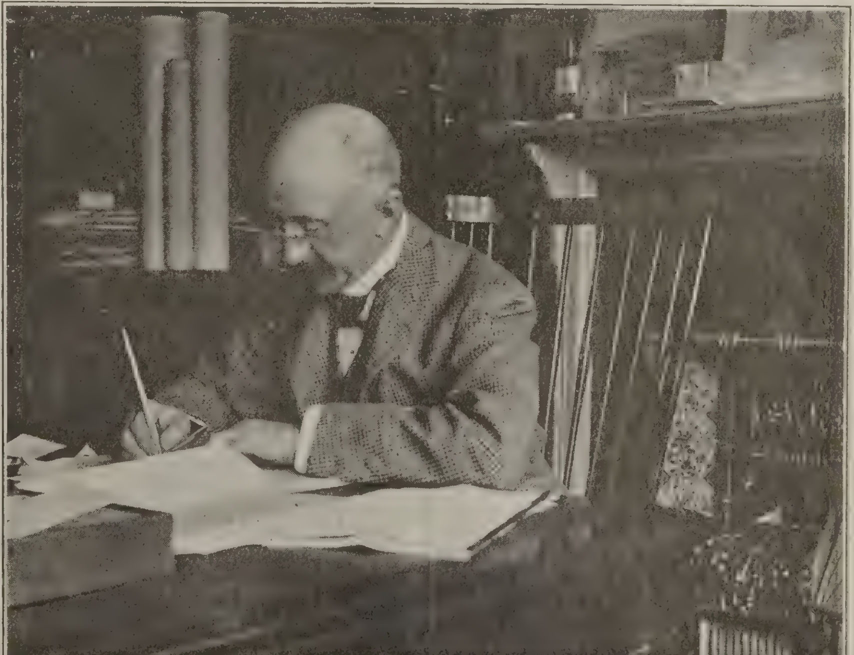
CONCRETE AND STEEL SECTION.

(MONTHLY.)

Floor Slabs. In the theoretical and practical investigation of floor slabs, which has been the outcome of the use of reinforced concrete on such an extensive scale in modern construction, a number of points have been elicited, the importance of which the authors of books on structural engineering and applied mechanics do not seem to have realised. The result is that modern theory directs more attention to such points than the ordinary student of applied mechanics obtains from the standard text-book. A floor slab is in one sense a beam, but it is very different in so far as it is supported on more than two sides or ends. In many cases designers calculate the strength of a floor slab as though it were a beam freely supported or continuous over supports, and where the reinforcement is chiefly in one direction, or the panel is a long oblong, this is practically a correct assumption to make, but many designers give consideration to the fact that a floor slab is a flat plate supported on all four edges, There is considerable difference in the statical theory of the strength of flat plates. For instance, Rankine and Grashof differ radically from Bach, while the proposals of the French Ministerial Commission on reinforced concrete furnish further differences from the former. There is not such material difference between the bending moment as determined by the different theories for a square slab supported on all four edges—at any rate, not sufficient to warrant very close attention on the part of designers, as the economy effected would be small. In connection with the strength of flat plates, there has been far too much theorising with very few experiments, and those that have been conducted have been upon specimens that are not allied to practical examples, and under conditions which are not similar to those in practice, so that all designers and students must feel the theory to be inadequate, just as steelwork specialists are in a quandary as regards the design of large struts, since the Quebec Bridge disaster. Whereas the problem is somewhat simplified in considering a square plate when the shape becomes irregular or consists of an oblong or circle, the theory becomes more difficult, and when we introduce the element of continuity which exists in nearly all reinforced concrete work we are badly in need of some experimental investigation to guide us in our theorising, which, in the present stage, must be rather slight and more imaginative than scientifically theoretical. It would be interesting and valuable to have a thorough investigation of the statical theory of flat plates. In practice an element is introduced which renders the actual conditions considerably different from those in ordinary theory, namely, the rigidity of supports, such as, for instance, a floor slab continuous over beams. An arching or flat dome action is then introduced in each floor panel, so increasing the resistance of the floor slab. As most reinforced concrete buildings are of the nature of frame buildings, the floor panels are almost always held rigid in this way, and where only a portion of the floor is loaded at a time the abutment of the neighbouring panels gives such rigidity to the supports that the floor panels, if reinforced upon the ordinary theory, based upon beam action, will be far too strong. There are examples of flat slabs without any reinforcement whatever that were constructed in the early days of concrete floor construction, resting between steel joists of wide span, that have been tested and have shown great resistance. This has been solely due to flat dome action. In the ordinary way it might be argued that designers should not take account of such action, but we are inclined to think that where any such action takes place it would be as well to make allowance for it, and consider it in our calculations. The ordinary system of relying upon a factor of safety is, of course, good up to a certain point, but adequate knowledge is far more satisfactory. We think there is plenty of opportunity for some investigation and experiment in this direction, and we are sure those engaged in the practical work of designing reinforced concrete structures will welcome any experimental work that might be directed by engineering professors and others, who have opportunities of undertaking it, while there is room for physicists to elucidate the statical theory of the subject a little more, and in this they might obtain material help by consulting those who have had practical experience, as well as being led to appreciate the practical conditions.

The Late Mr. Mouchel. We produce on this page a photograph of the late Mr. L. G. Mouchel, whose death was announced in our issue for last week. We need not repeat now the particulars of his career which have already been given in our columns, but we would take this opportunity to pay a tribute to the great work which Mr. Mouchel did as the pioneer of reinforced concrete construction in this country. As already recorded, about a year ago he took into partnership Mr. J. S. E. Vesian, M.Inst.C.E., and Mr. T. J. Gueritte, M.Soc.C.E., France, arranging that the chief members of his permanent staff should also participate in the business, which is now carried on under the name of L. G. Mouchel and Partners at 38, Victoria Street, S.W.

Continuity. Great emphasis by practical exponents of reinforced concrete is laid upon the monolithic character of structures erected therewith. In most other forms of construction the work is a collection of units, more or less independent, but the very nature of concrete is such as to necessitate the work being monolithic, and this implies that consideration must be given to the continuity that results from this monolithic nature. It was found in the early days of reinforced concrete, by practical workers, that cracks developed over the points of supports, and reinforcements had to be placed at the top of the floor slab at these points in order to prevent these cracks. The action of these reinforcements was to prevent the slab between the supports deflecting, and so causing a crack at the ends, *i.e.*, at first the slabs of the beams were acting as units freely supported at the ends. As soon as this type of reinforcement was introduced, however, continuous action resulted, and reverse bending moments at the points of support called for consideration. At first the allowance made in taking bending moments gave insufficient reinforcement over



THE LATE MR. L. G. MOUCHEL.

the points of support, and the floor construction was only partly continuous. This practice is still followed, and in many cases with good reason, for the detailing of the reinforcement is inadequate to give perfect continuity, while the supports are not generally quite rigid. Different systems, too, require slightly different treatment in this respect also, and therefore no hard and fast regulation can be adopted. Practice and theory seem to be more and more directed towards an extension of the principle of continuous action in floors. This, however, has its disadvantages, and if care is not taken unequal loading may result in trouble, as also temperature stresses, for if the size of the members is reduced excessively and dependence placed too much on neighbouring parts of the construction, acting continuously or monolithically, there may be insufficient rigidity and general absence of stability in the construction to resist irregular loading and shock, to which all structures are liable to be subjected. The disastrous failure of the reservoir at Madrid, which occurred some years ago, should be a warning in this direction.

ORDERING STEELWORK.

By A. E. F.

It is rarely the case that abundant time is available for preparing steelwork, as many contractors do not care to place the order for it before the building is set out and the footings are in, and as where ironwork is used it is usually wanted in the basement and ground floors, it is important that no time should be lost. The writer having some experience of the delays caused by insufficient particulars being furnished, hopes that a note of the particulars usually essential may be found of service.

It is not invariably the case that a drawing is supplied, nor is it always necessary, though it is in most cases an advantage. For small jobs a rough sketch dimensioned is often sufficient, since most steelwork firms for their own purposes usually make their own drawings for the shops, even when elaborate drawings are supplied. It is always an advantage, however, to make a scale drawing of the work, as in this case any dimension which is accidentally omitted (and this may easily occur) can be found by scaling. The favourite scale for constructional engineers would seem to be $\frac{3}{4}$in. to 1ft. for general plans, and $1\frac{1}{2}$ins. or sometimes 3ins. to 1ft. for details. The $1\frac{1}{2}$in. scale is sufficiently large for most details, and generally does not entail the use of too large a tracing.

It may be noted that although tracings of $\frac{1}{8}$in. scale plans undimensioned are frequently sent in to engineers for the preparation of work, they are too small a scale to safely work to, and if any fitted or framed work is required they are absolutely useless for the purpose.

Generally a fully dimensioned rough sketch is far preferable to an undimensioned drawing which has to be scaled.

Joists.

Rolled steel joists are stocked in lengths of even feet, and if odd lengths are wanted the cutting and waste is charged for, unless a lump-sum price has been quoted. In either case, as the work has to be paid for, it is better, where permissible, to order the nearest stock length and give a little extra bearing.

Where a basis price per ton is given, it is well to remember that on certain sections, enumerated below, a small extra per ton is charged as a rule.

On joists of British manufacture.

Sections under 4 by 3	...	7/6 per ton.
,, over 14 by 6	...	5/- ,,
,, ,, 9 by 7	...	5/- ,,
,, ,, 10 by 8	...	10/- ,,

A small extra is sometimes also charged on lengths over 36ft.

On joists of foreign manufacture.

For Sections less than $4\frac{3}{4}$ by $1\frac{3}{4}$ inclusive, 2/6 ton.
,, over 12 by 6 (excluding 9 by 7 and $17\frac{3}{4}$ by $6\frac{1}{4}$) ... ... 2/6 ton.
For 9 by 7 and $17\frac{3}{4}$ by $6\frac{1}{4}$ ... ... 15/- ton.

The above charges are those made by the principal rolling mills and factors, and are pretty generally kept to.

Holing.

In sending particulars for joists, care should be taken to give the exact position of all holes required in both flanges. If no sketch is sent, all measurements should be given from one end. Where a drawing is sent, to avoid drawing both flanges (supposing there to be drillings in both) the following conventional mode of showing the holes may be used. It is employed by many draughtsmen, but as it is not by any means generally agreed to, a note explaining it should be added to the sketch.

Hole in top flange 

Hole in bottom flange 

Holes in both top and bottom flanges 

This method enables holes on both flanges to be shown on one drawing.

The position of holes in the web should also be shown, whether for bolting wood plates or separators, or angle cleats or fish plates.

The spacing of holes in the web for cleats or fish-plates is generally left to the engineers, as there are standard spacings for holes, according to the size of the joist, worked to by most firms.

For holes in the web, however, for taking bolts to secure wood plates, the height and spacing should be given, and the usual rule is to measure the height from the underside of the bottom flange.

Holes are usually made $\frac{13}{16}$ in. to take $\frac{3}{4}$in. bolts for connections, and $\frac{5}{8}$in. to take $\frac{1}{2}$in. bolts for bolting wood plates to the web of the joist, so that if any other sized hole is wanted it should be mentioned.

Splay or bevel-cut ends should be shown full size, or a template sent, but the latter is not always necessary.

A template for this purpose should not be cut out of one piece of board. A case is known to the writer in which shrinkage was so bad in one of these templates that a mitre joint in two large compounds did not fit by $\frac{3}{8}$in. at one end of cut, and had to be hand-chipped at great expense.

Drawings should not be trusted to for angles of buildings, etc., which are not square; but if, say, 10ft. be measured along each side, and the dimension of the tying line between these two points be carefully taken, it will enable the work to be set out accurately.

Where girders follow a cranked or bent frontage line, it should be lined through and off-set measurements given at joints of girders.

In giving dimensions of compound girders a rule often forgotten by builders is that of writing the depth first. With joists the omission does not matter, but with compounds it is very confusing, since for example one can make up a section, say, 12ins. by 15ins., or 15ins. by 12ins., and both could be made up in more ways than one. The component parts of a compound girder should always be given if known, as well as the weight per foot.

With joists the weight per foot should always be stated, as there are many sections of the same overall dimensions, but differing in weight—in one case by as much as 11lbs. per foot.

Cast-iron Girders.

Besides the particulars of overall length and diameter, the thickness should be given, with particulars as to the cap, whether plain or ornamental. Where the junction of the base and shaft is strengthened by gussets or feathers, the length should be sufficient to sink these below the floor. As they are mostly at an angle of 45degs., this depth is the same as the projection of the base from the shaft. If columns are to taper, this should be stated.

Steel Stanchions.

A sketch of the base should be sent, or a note of the weight carried and the nature of ground and foundations, so that a suitable base may be designed by the steel contractors.

Solid Steel Columns.

These should have caps and bases of steel, forged and shrunk on. The writer has seen them sometimes fitted with cast-iron caps and bases, a practice which any engineer would condemn unhesitatingly.

Roof Principals.

These cannot well be ordered without a sketch or drawing, but in addition to the usual particulars sent it should always be stated whether the span is in the clear of the walls or between the shoes, and whether the shoes are flush with the surface of the brickwork, or, if not, how much they are to set back; also, whether shoes are to have lewis or rag bolts, or not; the distance apart of cleats for ridge (timber), the position of the cleats for purlins, or those to take a skylight curb, and the camber of tie-rod (usually about 1-30th to 1-40th of span). It is only too frequently the case, especially with roof trusses, that a pencil tracing from the architects $\frac{1}{8}$ or $\frac{1}{4}$ scale drawing is sent in to the steelwork contractors with the span between the walls marked as sole data, causing an unnecessary waste of time in correspondence to get the requisite particulars.

A rough sketch dimensioned, and with the suggested particulars given, would very often save a week in the time taken to deliver the work, and in most cases would be sufficient.

There is one other point often forgotten in ordering roof principals in the case of buildings where the walls are not parallel. The trusses may be kept at the same height, and the pitch varied to suit the altered span, thus giving a "winding" roof; the pitch may be kept the same, and the ridge may slope upwards, or the wall-plate level slope downwards to compensate, or a flat may be made at one side (carried by a joist), or at the ridge.

If a proper drawing is not sent, the method decided upon by the architect should be stated. In the case of a flat being used, this is generally shown, but very often where one of the first two methods is used no mention is made, in ordering, as to how the increasing span is to be allowed for.

CONCRETE AND REINFORCED CONCRETE.*

By E. P. Wells, C.E.

As the time at my disposal this evening is very short, I do not propose to enter into the theoretical part of reinforced concrete, but to generalise as a whole on its practical side.

In my opinion, the most important point in reinforced concrete construction is the concrete. It matters not how you reinforce with steel or iron; if the concrete is not good and will not stand a high compression, then the structure is bound to fail. Dirty materials, dirty water, poor cement, and bad workmanship are the points that have to be carefully looked into and overcome. As I am now speaking to practical men, you will readily understand why it is that I enforce throughout this paper the absolute necessity of cleanliness.

You will have no doubt observed about six months ago an article in one of the weekly journals in reference to

"Dirt in Concrete,"

where an exponent of reinforced concrete construction advocated the use in some cases of 10 to 15 per cent. of loam to increase the strength of concrete. Since that statement was made I have ascertained from the author that it occurred in the United States, where a cement was used that contained a large amount of free lime. You can readily understand that where there was an excess of free lime, and the briquettes were subjected to tension, the result could not be good; this clay was put in to kill the free lime, and they then, so it is said, got a greater tensile strength out of the 3 to 1 briquettes. Of course, nobody in this room would for one single instant allow a cement to be used when it contained such an abnormal amount of free lime as required clay or any other material to kill its properties.

Test for Free Lime in Cement.

With regard to free lime in cement, which is a thing to be carefully avoided, there is no better test to ascertain this than the "Chatelier." This instrument is very simple, and one which every clerk of works should have. It is a section of a small cylindrical tube cut off at a given length, and with a saw cut along its axis. To this are connected two arms or pointers of a given length as compared with the diameter. The cement is gauged with about 25 per cent. of water filled in to the tube, kept in water for twenty-four hours, and then put into cold water and brought up to boiling point and boiled furiously for six hours. Before the boiling, measurements must be taken at the ends of the arms or pointers, and after boiling for six hours should be again measured, when the difference will show the expansion. If this exceeds more than 4 mm. the cement should not be allowed on the site of the works, or it should be aerated to such time as the expansion shows no more than the 4 mm. This is easy of application, and makes all concrete work absolutely safe, and with no possible chance of any accident happening owing to the presence of free lime.

But a Chatelier test, though showing that practically no free lime is present, does not always indicate that the cement is of excellent quality, as a boiling pat may become quite tender, although microscopically sound, and it is necessary to have a hard boiling pat. There are cases where you only get an expansion of 2 mm., and yet the cement will give you a plastic pat in water, and soft and not adhering to the glass at the end of twenty-four hours. It will also give you a boiling pat miscroscopically sound, and yet the pat is quite tender—not hard, as it should be.

So, in addition to the Chatelier test, it is advisable that a boiling pat, after boiling, should be hard and perfectly sound when microscopically examined. You should also examine for

Contraction Cracks

before boiling, even if the pat is kept in a damp box. Sometimes there will be a crack right across the pat which you can see before you boil, and at other times the crack is about the middle of the pat. The contraction cracks can be easily distinguished from expansion cracks, as the expansion cracks are on the edges of the pat, and the contraction cracks radiate from the centre.

It is often found that there are more contraction cracks in winter weather in the damp box than there are in the summer-time, and it is thought that this is caused by the lid of the box being opened too often, and possibly left open for a time. A pat put plastic directly under water after mixing should adhere firmly to a sheet of glass and be hard 24 hours after.

I think it just as well to state that if a cement gives you the same compression and tensile tests year in and year out, and only varies to a slight extent, it will be quite safe to use that cement direct from the truck forty-eight hours after arrival, provided the following tests are withstood:—Chatelier not more than 4 mm., boiling pat hard and microscopically sound: pat put plastic on a sheet of glass, and hard twenty-four hours after.

Keep the temperature of your test room day and night at 60 degs. Fahr. as nearly as possible.

When a Chatelier test is higher than 4 mm., and the cement is re-tested from the bags to see if it has come down to 4 mm., always test from the centre of the bag heap, as the outside bags are often low Chatelier in a case like this, and the inside sacks would still give a high Chatelier test. There are some peculiarities exhibited by the same cement. Some will show 6 mm. fresh and 36 mm. when six weeks old.

The Neat Cement Test.

You have all been in the habit for years past of depending entirely upon the tensile tests of neat cement and 3 to 1 sands, the compression tests having been absolutely ignored. But on the Continent, especially in Germany, all neat tests have been given up, and they simply confine themselves to the 3 to 1 sands in tension and compression. The neat cement test is no criterion of what the value of the concrete will be, and even 3 to 1 sand tests are in a great many instances absolutely unreliable, especially when very fine sand is used.

You are aware that in reinforced concrete work—and with concrete work always—the same is subjected to compression, and never in tension, unless some accident has been made in design or in the execution of the works. Such being so, you can see that tensile tests are absolutely valueless, because they cannot possibly be any indication as to what the crushing resistance of the concrete will be.

Neat tests are good only to give the initial and final set of the cement; the initial set should be about sixty minutes; also to see whether there is any expansion in the Chatelier test, the colour when made, and also when broken at different periods. I could give you results of neat cement where it runs up to over 800 lbs. an inch in seven days, and over 1,000 lbs. an inch at twenty-eight, and the concrete results have been very poor.

Storage of Cement.

At the present date cement is very much more finely ground than it was a few years ago, and it behoves all those having charge of concrete work to be extremely careful as to the manner in which the cement is stored. In the old days of coarse grinding, the residues, if they contained free lime, required a long time for aeration, so as to make the cement safe. In the present day, with the fine grinding, should any free lime be present, it is almost immediately hydrated when the same is made into concrete.

Great care must be exercised that finely ground cement is not stored in an open shed where the wind can blow through, as the same becomes quickly hydrated and greatly reduced in value. Very finely ground cement should be stored in covered wooden bins and emptied out of the sacks directly the same is received on the site of the works, as storing in sacks is the worst method imaginable. I am pointing this out to you as I know of several cases lately where finely ground cement has been stored for two months in an open shed, and the contractor has been very much surprised when he started to use it to find that it was to all intents and purposes perfectly useless for reinforced concrete work.

The quicker this cement is used after it is received on the works the better, as storing, unless in air-tight bins, causes rapid deterioration, owing to the absorption of water, and partial killing of the cement.

The Vicat Needle.

To obtain the initial and final set of cement, it is very necessary that you should be provided with a Vicat needle. This instrument can be purchased for 30s., and is used as follows:—A small pat of cement is made and placed under the needle. When the needle fails to go to the bottom it tells you the initial set of the cement, and when the needle fails to make a mark on it, it shows the final set. The advantage of having a 60-minute initial set is that it gives you time to get your concrete into position before the chemical action is far advanced. Of course, these tests should be carried out simultaneously with the Chatelier tests.

Aggregate.

With regard to the aggregate, it is very necessary that great cleanliness should in all cases be observed. You are no doubt practically aware that the presence of vegetable matter and mud has a most deleterious effect on concrete, and it is very necessary that these foreign matters should be carefully excluded. It very often happens when crushing stone that if it has been crushed in the open air and in wet weather the dust caused from the crushing adheres to the stone, and this is often taken for dirt. It is advisable that this fine powder should, if possible, be eliminated. If not, then it is advis-

*A paper read before the Incorporated Clerks of Works Association of Great Britain at Carpenters' Hall on May 11th, 1908.

able to wet the stones before the same are made into concrete.

For reinforced concrete work no stone should exceed ¾in., unless a huge slab of great thickness is being made, when 1in. to 1¼ins. as a maximum may be employed; but where the same is required for piers, columns, floors, etc., the ¾in. is a maximum and more than large enough. Where flints or pebbles are used they should be put through ¾in. screens.

With regard to bricks, the whole of the dust should be eliminated after crushing, and if the bricks are of a soft nature and porous they should be soaked in water so as to take up all the moisture that is possible before being mixed with the sand and cement. In fact, all stones, especially where porous and of the oolitic series, should always be soaked in water before being used. It is very much easier afterwards to make this mass work easily.

Leighton Buzzard Sand.

If water is added to the aggregate when the same is being mixed, the moisture is taken up by the porous stone, and the cement sets too readily, with the result that the concrete does not form a perfectly homogeneous mass. The difficulty in this country at the present time, now that reinforced work is becoming general, is to get sand sufficiently coarse. In the Midlands it is very difficult to get sand from any pit but that is exceptionally fine—so much so that when mixed with the cement it practically kills the same, and this is proved under the crushing machine, where 3 to 1 sand cubes made with Leighton Buzzard sand, as compared with 3 to 1 made with a very fine sand, gave a resistance for the former of over ten times greater than the latter at seven days old.

I have found it necessary in some works to employ Leighton Buzzard sand, using half of this to half of the fine sand, and in some cases two parts of Leighton Buzzard and one of fine. Even this one-third addition of fine sand reduces the crushing resistance very considerably.

Leighton Buzzard sand is expensive to use, but it makes magnificent concrete, and less cement can be used. To get the same strength with a very fine sand that one does with the Leighton Buzzard would mean putting two parts of cement to one part of sand.

Necessity for Clean Sand.

Great care should be exercised that all sand is perfectly clean, because should there be vegetable matter or mud in the sand the resultant concrete will be very poor indeed. You have no doubt often observed when cement mortar is being made with fine sand, and in the proportion of 3 to 1, how extremely hungry it is—in fact, to the non-technical man it would appear as if practically no cement had been added, whereas had the sand been all of a coarse nature every grain would have been covered with cement.

With clean sand it is possible to make a fairly good concrete, even if the aggregate is dirty, but if the sand is dirty, then no good results will be obtained, even with a clean aggregate.

One of the great secrets in the making of concrete is to ensure that all materials are clean, and if such is the case, and the cement is good, then you have a concrete that will give you an enormous resistance to crushing. Ordinary 5 to 1 concrete made wet, and as used in reinforced work, even where the cement is of a very medium quality, should give not less than 140 tons per square foot resistance to crushing at twenty-eight days old. This will give at a period of three months about 200 tons per square foot, and at the end of four years will attain an ultimate of possibly 300 tons.

Wet Concrete.

Concrete for reinforced work should always be made fairly wet, but not too wet. Where wet very little ramming is required; in fact, a trowel will do the whole of the work. Too much moisture will simply cause the cement to rise to the surface and run away, and if it is rammed too much it will still further drive the cement out. It is far better in making concrete for reinforced work to have an excess of sand than too little, as an excess will ensure a thoroughly good homogeneous concrete, and exclude air and also moisture where used in tank and other forms of construction.

Sand Finish to Floors.

Where it is required to have a granolithic or sand finish as a wearing surface in all floor construction, then this work must be done simultaneously with the body of the concrete, or the same will be of very little good. Where granolithic finish in thin layers is put on to concrete that has set longer than twenty-four hours, it will invariably leave the body of the concrete at some portion of its area. This will be very apparent at the junction of slabs, where the ends will invariably curl up; this means that that portion of the granolithic finish which has left the mass becomes absolutely valueless as a compression part of the T-head of the floor slab. It is advisable, if a really excellent wearing surface is required, that too much labour should not be put into the granolithic finish, as after the initial set has taken place, any trowelling breaks up this set, and the strength of the concrete is very seriously diminished.

I am perfectly well aware that it is the aim of all those who lay granolithic to give an absolutely smooth and true surface. This is very pleasant to look upon, and great credit is generally given to the pavior who gives the best and truest finish, but the result is that the upper surface very rapidly wears away, and causes a lot of "sanding" or dusting. If the granolithic surface is once trowelled, then you will have an excellent wearing surface, and your upper layer of concrete will be from 20 to 30 per cent. stronger. In these days of finely ground cement you cannot afford to go breaking up the initial set too often, but with the old coarsely ground cement it did not make much difference, as it took a much longer time to saturate the mass with water.

Centering.

With regard to the centering that is required for beam, slab and column construction, too much care cannot be exercised in seeing that the work is thoroughly vertical or horizontal, as the case may be. With regard to beam construction, a camber of at least ⅛in. in every 5ft. of length should be allowed, as this invariably comes out during the process of ramming the concrete.

You should exercise great care in seeing that all the folding wedges are perfectly firm, and methods should be employed to prevent any movement of the same. It is advisable, after a beam has been filled, to see whether the camber has been taken out, and if so, while the concrete is green, the folding wedges should be driven home, and so put camber back into the beam again. It is not so necessary to have a camber for the floor construction, but it is advisable to have a little. I dare say that many of you have observed in reinforced concrete beams that there has been a great deflection in the centre, or a bowing, and many have jumped to the erroneous conclusion that it was due to a deflection of the beam. In nearly all cases that have come under my notice I have found that this has been due to

Settlement of the Supports,

owing to the soft nature of the ground, and I strongly advise you all, before any concrete is filled into the moulds, to ascertain that the ground is going to more than carry the weight to be put upon it. While I am on this point, I may as well inform you all of two or three accidents that have taken place owing to this settlement, which at the time, and before the shuttering was struck, was not observed. The defect in the beam was at the points of support, and it was found that, owing to the settlement of the strutting, tension had been put into the upper portion of the concrete, close alongside the walls, brickwork gripping the concrete and so preventing it yielding. This caused a crack right through from the top to the bottom of the beam, and generally at an angle of 45degs. Fortunately in the cases that I mention the flat plate floor had not been put on, otherwise there is no doubt that failure would have taken place with the beam so loaded. In one particular instance where the strutting had settled, a beam had cracked through at both walls from the reinforcing up to the flat plate of the floor. This beam was tested to the load that it had to carry, and the deflection in the centre was only $\frac{1}{48}$in., the span being 25ft. and the depth of the beam 15ins. The cracks had been plastered over previous to the testing, but did not show any sign after the floor was loaded up, so that the crack, though passing right through the beam, did not in any way affect the strength of the same. Still, these defects are unsightly, and anybody not thoroughly conversant with reinforced concrete construction would certainly come to the conclusion that an accident was bound to happen. You will now see how necessary it is to be careful that in no case shall the strutting give owing to the soft nature of the ground.

Beam Casing.

For beam casing it is not advisable to use any wood that is less in thickness than 1½ins., and I should always recommend that the wood should be thicknessed. It is easier to handle, requires no packings, always has a smooth surface, and does not require the use of oil, soft soap, plaster, or a wash of any kind or description, as the wood will leave the concrete perfectly clean and smooth; but where boarding is used rough from the saw, then it becomes absolutely necessary to put some medium on to prevent adhesion of the furred surface of the wood to the concrete.

For sheeting to the flat plate floor 1¼ins. may be used, but the supports are required to be placed near together so as to prevent deflection.

Methods of Making Centering.

There are many ways of making centering; everyone has his different ideas on the subject, and the whole is a question of cost. Unfortunately, timber cannot be used many times over owing to its warping and the fearful amount of waste that takes place in cutting, besides the injury to tools by cement and sand on the

surface. For column shuttering it is advisable to use 1½in. to 2ins. stuff. The columns should be cased in on three sides, only the fourth side being left open and the boards brought up in most convenient breadths.

Striking.

If possible, all shuttering should be left for at least a week, and for the beams the sides only to be struck, the bottom board being left in, as also all the struts or supports, for at least three weeks from the time the beam concrete has been filled in.

This to a certain extent depends upon the weather. In the winter time, and if there has been no frost, I strongly advise the strutting remaining in for at least four weeks, but for the flat plate floor, if the span does not exceed 6ft. to 7ft., the timber may be struck within seven to ten days, so long as no weight is put on to the floor, but the longer the centering and sheeting are left up the better, and the stronger will be the work. If it is required to put weight upon the floor, say, within a fortnight after it is made, then the strutting must remain up, or a permanent set is more than likely to be put into the beam or floor slabs.

In the summer time centering and sheeting may be struck within a very short time; in fact, in some cases the sides of the beams can be removed within twenty-four to forty-eight hours, especially if the cement is of extremely good quality and gives high crushing results; but if the cement is poor, then under no circumstances must the sides be removed within a week.

Reinforcement.

You are all perfectly well aware that concrete, owing to its nature, does not admit of any tension being put into it, either when acting as a beam or as a slab. Such being the case, it becomes necessary to use iron or steel to reinforce the tension member to take up the stresses that are to be put into it. Many of you have no doubt observed that, when a concrete beam is being tested, the deflection as a rule is very small. This is always the case if the concrete is good, but if it is a poor concrete, or made with cinders or any such rubbish, then the concrete is very elastic, and the deflection becomes great.

A good cement, in setting in air, always contracts, and this contraction puts into the steel an initial compression of somewhere between two and three tons per square inch of sectional area. This, of course, has to be taken out by loading before any tension is put into the steel. In the case of a column this initial compression is an element of weakness, and should be allowed for accordingly in column designing. Of course, in beam construction and floor slabs where the steel is in tension, then it is of great advantage, because it means that with dead load only there is practically no stress on the steel whatever, and in a great many cases the structure has to be slightly loaded before tensile stresses are put into the steel.

Placing of Steel Members.

It is a matter of great importance in the construction of this class of work that all steel members should be put in position as shown on the working drawings, and I cannot but impress upon you the necessity of seeing that this is carried out; also that the rods have the amount of concrete round them that is shown, and the rods not allowed to come on to the surface and so become oxidised in time, and valueless.

When the rods are first put into the concrete the same should be wet so as to ensure that they will be thoroughly embedded, after which the concrete may be slightly dryer, but then it will require more ramming.

Wash.

Some engineers recommend that where new concrete is put on to old, or that which has previously set, a neat cement grout should be used as a wash. I am of opinion that the best method to adopt is to make a mortar of one part sand to one part of cement, to wet the concrete well, first scoring, if necessary, then put ½in. of this mortar, then your concrete proper. This will also ensure a thoroughly good joint and the mortar will work its way up into the concrete and form a homogeneous mass, whereas if the cement grout only is used, and should the first layer of concrete that is put on have an insufficiency of sand, there will never be a good joint.

Strength of Steel.

With regard to the strength of steel, this does not come within your province as clerks of the works, but it is advisable where the same is specified to be of a given strength and to be tested before being used, that you should be advised by the architect or the engineer whether it has passed all tests, and at the same time, for reference, the results should be kept upon the site of the works.

The Question of Rust.

You are evidently aware that there has been a great amount of discussion in the papers as to the advisability, or otherwise, of putting rusty steel into concrete. A great many people advocate that the steel should be quite clean, and that it should be covered over with a coat of cement grout before being used. I am of opinion that before steel is put into concrete it should be slightly rusted so as to get off all the mill scale, but that it should not be badly rusted so as to form scales. Rusty steel or iron bonds better to concrete than where the surface is quite smooth.

If the steel rods are well covered with concrete there is no further possibility of any corrosion taking place; in fact, the presence of lime, which, as a rule, is 60 per cent. of the cement contents, in the concrete absolutely prevents any oxidation taking place. A great many people believe that, if water should by any possible chance touch the steel embedded in the concrete, it will cause the same to oxidise and in time disrupt the mass. Where stone concrete is used I have never found such to be the case.

Corrosion of Steel in Breeze Concrete.

Corrosion of steel in breeze concrete is more often than not due to the presence of oxide of iron, and not to the sulphur—*i.e.*, the porous breeze concrete lets the air get through to the iron. The sulphur in the breeze has a deleterious effect on the concrete, in fact will disintegrate the concrete if there is too much sulphur in the breeze. Therefore, breeze should never be used for concrete. Roughly speaking the corrosion of the steel is more often due to the oxide of iron found in the breeze, which, coming into contact with the steel, induces further corrosion; but I should think the main corrosion is due to the porosity of the breeze concrete admitting the air to the steel.

Some months ago I made experiments with what is ordinarily known as breeze concrete. The experiment was with a beam of 14ft. span by about 4ft. wide and 6ins. thick. Half-inch rods for reinforcing were used with about ¾in. of concrete covering them as a minimum. The rods were clean when put in, but after the lapse of twelve months, when the beam was broken, the rods were badly oxidised, and deep pittings had taken place in many instances.

There are many instances of this kind, and I strongly advocate that in no case whatever should breeze or cinder concrete ever be used where small rods for reinforcing purposes are inserted.

You may be aware that the ordinary lime in cement is not in the form of carbonate, but in the form of silicate of lime and aluminate of lime. This, after gauging, is partially changed into hydrate of lime, which again is gradually changed into carbonate of lime, due to a slow absorption of carbonic acid from the atmosphere, but this takes a great many years to form in any large quantity.

Preservation of Iron in Concrete.

I will now give you an instance of some concrete that I broke up on the foreshore of the River Thames that had been in position for over twenty years. The concrete was 12ins. thick and placed on top of one of the outfall sewers. It was covered for four hours, twice every twenty-four hours, by the tide, and water more or less got to the heart of the concrete. In the centre of the concrete were built in 1¼in. tie bolts, and when the concrete was broken up every one of these bolts was perfectly clean, and in some cases quite bright; whereas, where the bolts passed outside of the concrete and through timber piles, then they were badly oxidised. Adjoining the sewer was an old river wall, which I should say had been made of 8 to 1 concrete. In this wall I found old nails that had been there for over thirty years, and which were quite bright.

In conclusion, I cannot do better than repeat what I said in closing a paper which I read before the Royal Engineers at Chatham in March, 1903—by again impressing upon you the absolute necessity for cleanliness in the use of the materials employed, the purity of the water used, the efficient mixing and ramming of the concrete, its protection from sun and cold during construction, and last, but not least, if lasting structures are required, the necessity of obtaining, at whatever cost, the very best unadulterated Portland cement that is made.

FERRO-CONCRETE GROYNES.—The patent rights of Messrs. Owens and Case, in connection with concrete groynes for coast protection, have been purchased by Messrs. Ferro-Concrete Constructions (Hennebique system), 38, Victoria Street, Westminster.

MONT BLANC TUNNEL SCHEME.—Mr. Radcliffe Ward, an English engineer, has, in conjunction with a Swiss engineer, M. Butticaz, obtained a concession from the Swiss and Italian authorities to construct a railway between Martigny, in Switzerland, and Courmayeur, in Italy, the latter town being on the main line to Turin. The distance from Martigny to Courmayeur will be about 45 kilometers, *via* Orsières, and through the projected tunnel under the Col Ferret, which is situated half way between the Mont Blanc and the Grand St. Bernard Pass. It is estimated that it will take three years to complete the line and bore the tunnel, and the cost on Swiss territory alone is put down at £1,400,000.

THE WESTMINSTER TRUST BUILDING.

Perhaps the most interesting and striking feature in the extension of the Westminster Trust Building, now in course of construction in Broadway, Westminster, are the floors, which are being constructed by the Kleine Patent Fire-Resisting Flooring Syndicate, who are also constructing the roofs and staircases on their system of reinforced brickwork. These floors are as simple as they are ingenious and are gaining the same high reputation in this country as they have gained abroad.

The floors are of various types, to meet the requirements of the building.

Fig. 1 shows the type adopted for spans up to 9 ft. The bricks here are all laid flat, and the brick slab, $4\frac{3}{4}$ in. thick, is constructed to carry all the load required. As a level ceiling underneath is desired, this type of floor has been filled up with breeze and breeze concrete. This breeze forms no part of the weight-carrying construction, and to prevent the corrosion of the joists (which sooner or later must take place where coal residues come into contact with steel), the joists are protected with a coating of cement mortar.

Fig. 2 shows the type of floors adopted for spans up to 10 ft. In this case the bricks are placed every two alternate courses flat and on edge, making the floor, with the filling, 7 ins. thick, and as level ceilings in this part of the building are not required these spans are built on stone concrete haunches on the girders. This construction on haunches of good stone concrete is preferable to building on

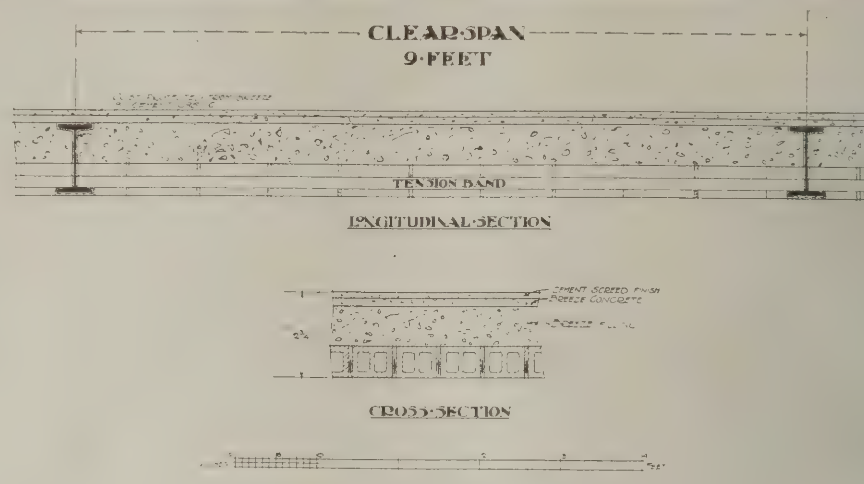


FIG. 1.

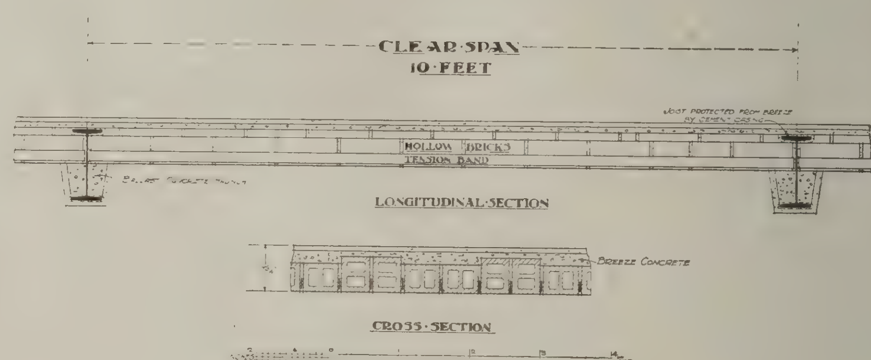


FIG. 2.

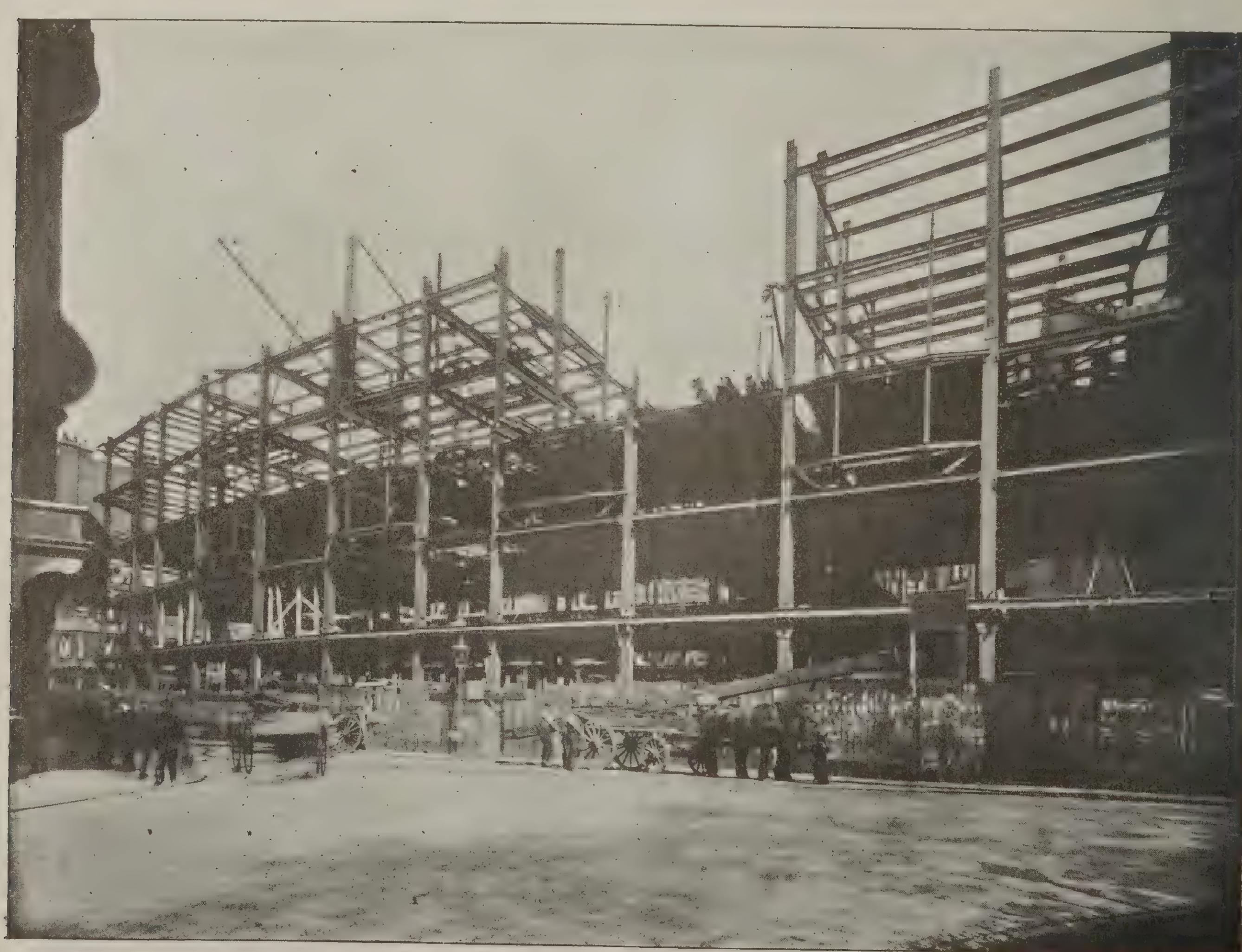


FIG. 4.—THE WESTMINSTER TRUST BUILDING, BROADWAY, WESTMINSTER.

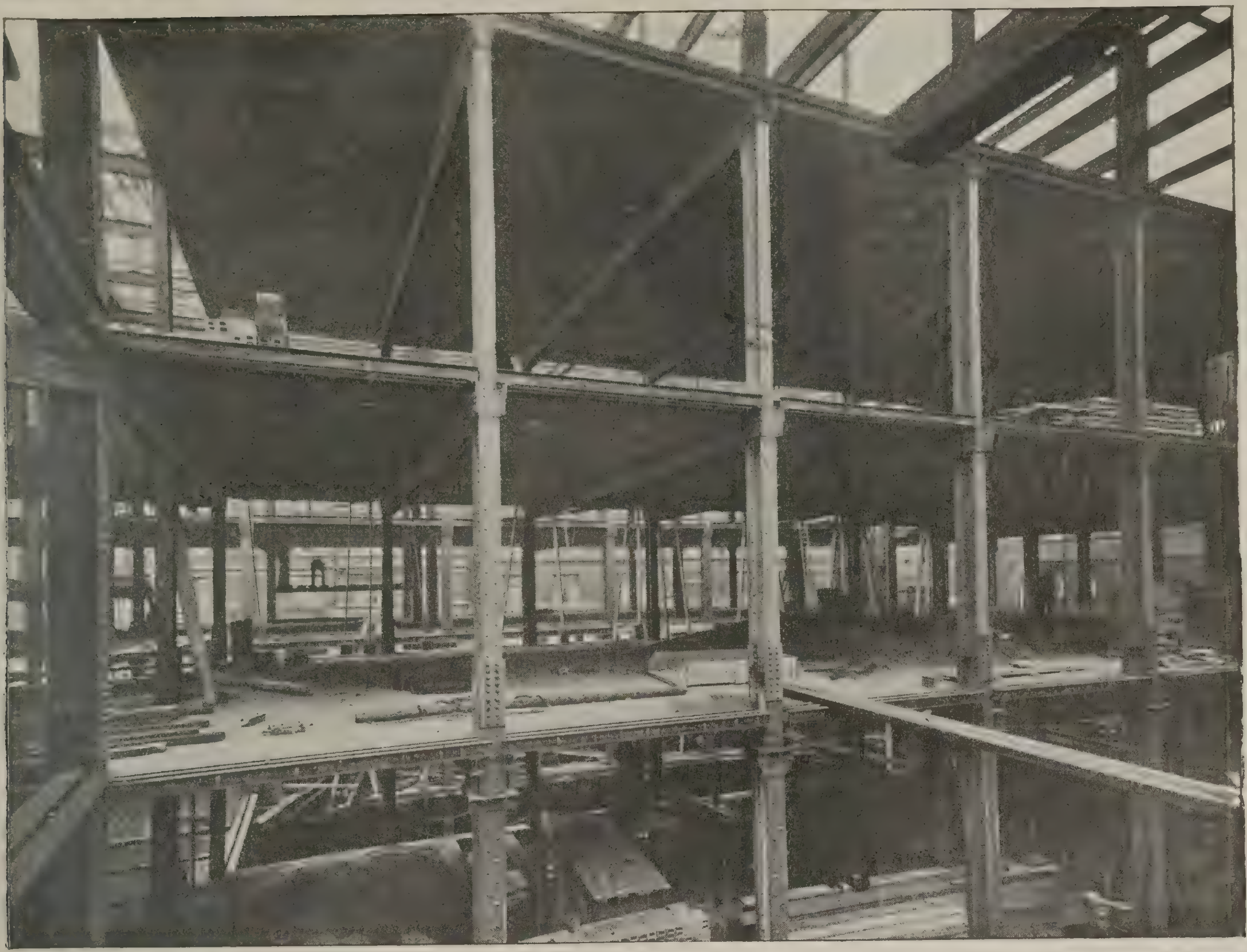


FIG. 5.—KLEINE FLOORS AT THE WESTMINSTER TRUST BUILDING.

angle irons. It is not only as economical but it strengthens the girders and is most convenient if the levels of the floors have to be altered from the original plans. Fig. 3 shows the floors of spans of 13 ft. and upwards. These floors are 7 ins. thick, and in this case the stone concrete filled in over the bricks forms part of the weight-bearing construction. The bricks in this case are laid in rows alternately flat and on edge. This variation, or rather corrugation, in the brick slab is for the purpose of giving the concrete an absolutely firm bond with the bricks.

The stairs and roofs are built on the same principle according to the spans.

It goes without saying that the reinforcement of the floors and the section varies according to the spans and the loads which the floors are required to carry.

The Principle of Construction.

The Kleine floor is scientifically correct in construction. The strains in compression and in tension are calculated with an accuracy and margin of safety which accounts for the floors having stood all the many severe tests to which they have been put.

It is claimed that with the Kleine floor less depends upon the care and intelligence of the individual workman than in the case of concrete floors. Further advantages are fire-resistance and soundproofness.

In studying the erection of this building it was noticeable how easily the floor construction kept pace with the steelwork, though we are informed that at no time have there been more than three bricklayers working. From this may be gathered the speed of this method of construction.

The floors are stressed in compression, as regards the brick or stone concrete, to 425 lbs. per sq. in. The reinforcing metal is stressed in tension to 6 tons per sq. in., while the maximum adhesion of cement mortar to the steel is taken at 64 lbs. per sq. in.

The steelwork was left unpainted throughout the building, as the Kleine

FIG. 6.—KLEINE FLOORS IN COURSE OF CONSTRUCTION AT THE WESTMINSTER TRUST BUILDING.

bricks are bedded in cement mortar where they lie or abut against the joists, thus providing perfect protection against corrosion, which is only assisted by paint unless fresh coats can be applied.

We are informed by the Kleine Syndicate that, by the courtesy of the owners and architects, they are permitted to show any architect interested over the building.

We publish a steelwork detail of one of the stanchions. The building is of complete self-supporting steel-frame construction, although, to comply with the requirements of the London Building Act, it will be necessary to encase it with walls of the regulation thickness. The building, however, has been designed so that the walls may be supported at first-floor level on all fronts independent of any brickwork foundations, so that in the event of any re-arrangement of the building at ground-floor level the entire masonry facia may be taken away between ground and first floor. The total

FIG. 3.—TYPE OF KLEINE FLOORS, 13 FT. SPAN, USED IN WESTMINSTER TRUST BUILDING.

weight of the steelwork in the building is between 1,100 and 1,200 tons. The tendency to utilise steel frames or skeletons for the construction of modern buildings is increasing rapidly, and Messrs. Redpath, Brown and Co., Ltd., who have been responsible for the designing and execution of the steelwork in this example, have recently carried out many such steel-frame constructions throughout the country.

It will be seen from the drawing that the details are prepared by this firm in accordance with the most up-to-date and most approved principles. The former method of making templates for every part of the construction is done away with, and the dimensions are set out directly upon the sections from the figures given upon the drawings. The drawing of the stanchion detail is particularly interesting, showing connections economical in manufacture and erection. The differences in detail from the work of other designers will be apparent on close inspection.

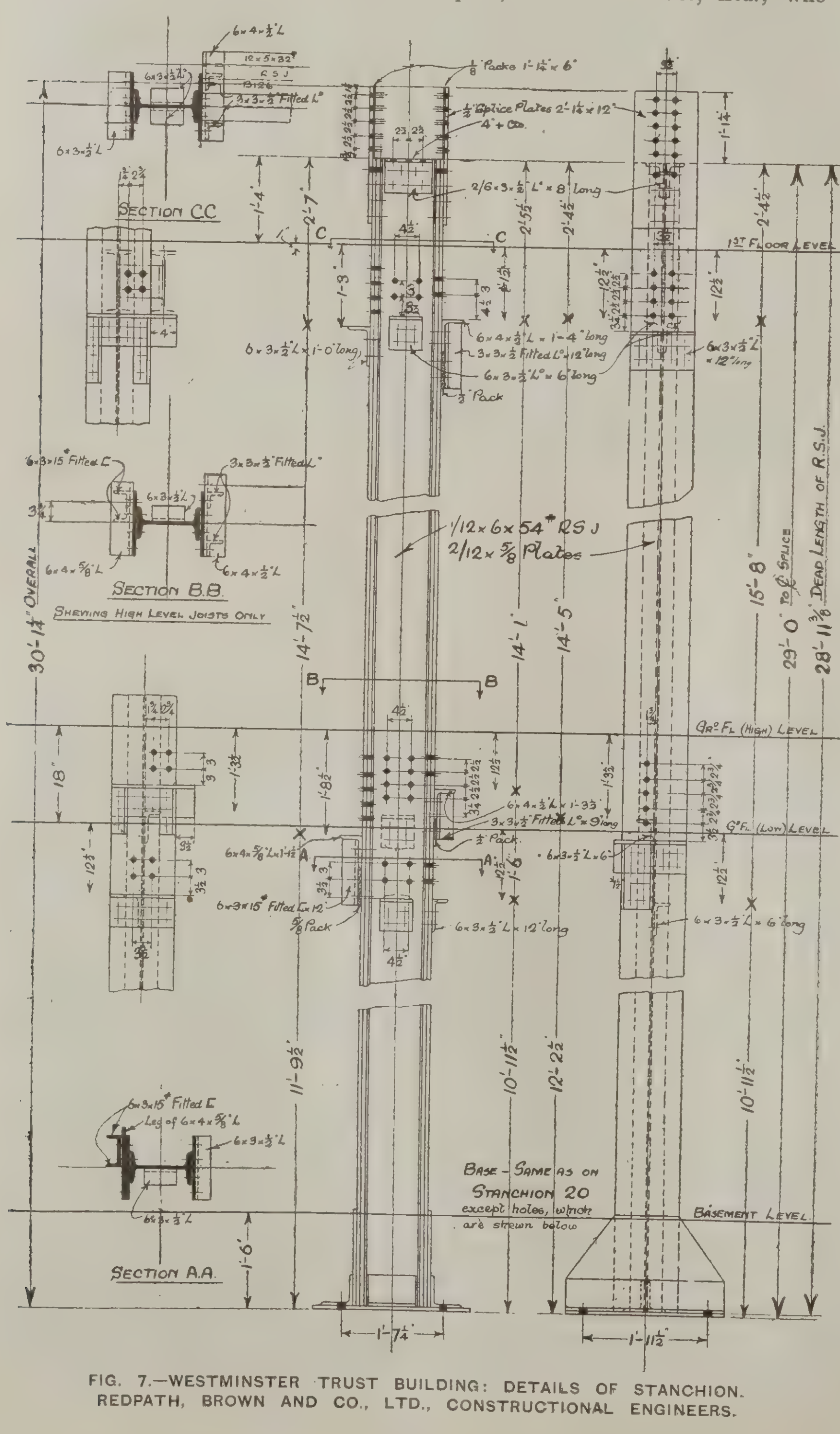


FIG. 7.—WESTMINSTER TRUST BUILDING: DETAILS OF STANCHION. REDPATH, BROWN AND CO., LTD., CONSTRUCTIONAL ENGINEERS.

MIDLAND COUNTIES BUILDING TRADES' EXHIBITION.—The organisers of this exhibition, which is to be held at Bingley Hall, Birmingham, from October 12th to 21st next, are laying a wood flooring throughout the Hall, at very considerable expense. Complimentary season tickets for the exhibition will be posted to all architects and master builders throughout the Midland Counties, West of England, and Wales, so that a large attendance of the right sort of visitors is assured.

* * *

REINFORCED CONCRETE BRIDGE CONSTRUCTION.—The Northumberland County Council have placed with the British Concrete-Steel Co., of Newcastle-on-Tyne, the work of widening their existing masonry bridge over the river Coquet, at Rothbury, to be carried out in reinforced concrete. By cantilevering over the footpaths on each side, the width of the latter will be increased from 16ft. to 26ft. The parapet walls of the footpaths are to act as beams carrying the spans from pier to pier, a distance in each instance of about 42ft. To the same company the county authorities have also awarded the contract for taking down and replacing the two northerly arches, 34ft. and 60ft. respectively, at the bridge over the river South Tyne, at Haydon Bridge. The gradient is to be considerably improved, as the 34ft. arch will be lowered 4ft., and the 60ft. arch 3ft., whilst the width of the bridge will be increased from 13ft. to 17ft. Both these bridges will, on completion of these operations, be capable of supporting 17-ton steam rollers. The British Concrete Steel Co. last year rebuilt, in reinforced concrete, two 40ft. span bridges for the Northumberland County Council at Lucker and Lilburn, and for the same authority they have recently built a new bridge at Nunriding, Mitford, near Morpeth, to take the place of an old single span masonry structure. The reinforcement used in this instance was in the form of Indented bars.

REINFORCED CONCRETE SYSTEMS.

No. XX.—The "U.K." Systems.

In this article we shall describe the general nature of several systems of reinforced concrete construction employed by the United Kingdom Fireproofing Co., Ltd. These systems are the invention of Mr. George H. Gascoigne, who, it may be mentioned, formerly occupied the position of surveyor to the Columbian Fireproofing Co., after which he became London manager to the British Fireproof Construction Co., and, later, engineer and superintendent to the National Fireproofing Company. His practical experience, therefore, of several systems of fire-resisting construction and reinforced concrete is extensive, and for a number of years he has paid attention to the theory of the subject. The systems described in this article are the outcome of that investigation and experience. The patents covering these various methods and forms of construction are No. 25,301 of 1905, and No. 20,766 of 1907.

Mr. Gascoigne's first patented system is that illustrated in Fig. 1. This was used for the first time at the Manchester Royal Infirmary three years ago. That job was a very large one, the area of floors constructed on Mr. Gascoigne's system amounting to about 90,000 sq. ft.

FIG. 9.—FLOOR AT ROYAL INFIRMARY, MANCHESTER, IN COURSE OF CONSTRUCTION.

History of the Company.

The progress made by the United Kingdom Fireproofing Co., Ltd., since its formation about twelve months ago has been remarkably rapid. Already 40,000 sq. yds. of flooring have been, or are being, constructed. The amount of the contracts represented by this and by constructional steelwork is £42,000. It is obvious that the company do not pin their faith to any one system of construction, but recognise that different circumstances require different treatment, and the systems referred to in this article, while meeting all general requirements, are subject to modification under special conditions.

A Solid Floor.

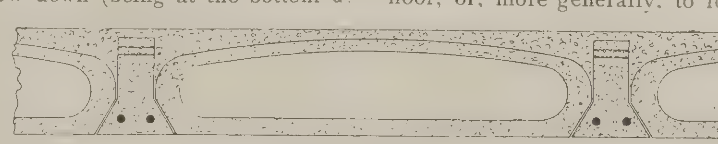
In the ordinary way, the type of floor construction shown in Fig. 2 is most favoured. This, it will be seen, is a solid concrete floor slab reinforced with rods cranked up near the supports so as to resist the reverse bending moment at these points, and resting upon main beams consisting of steel joists embedded in concrete, or reinforced concrete beams, being protected against fire by a soffit tile of concrete moulded at the works with embedded flat hoop-irons that clip on to the joists. Such a system of construction is admirable for small spans and light loads.

A Hollow Floor.

Another variety is that shown in Fig. 3, in which hollow terra-cotta blocks are first laid upon the centering, with a space between each row. Reinforcing rods are laid in these spaces, and concrete is filled in over the top of the tiles to form a shallow T beam or ribbed slab construction. The advantage of such a floor is not only lightness, but sound resistance. A solid concrete floor is not sound-resisting, nor is it a particularly good non-conductor for heat or cold, but when a reinforced concrete floor is constructed hollow in this manner, it fulfils all these requirements and at the same time effects a saving in weight. Floors of this type of construction are extensively used in the United States. They have considerable strength, because the top layer of concrete is sufficiently thick to give ample compressive area, while the steel is sufficiently low down (being at the bottom of the ribs) to give an adequate moment of resistance; the terra-cotta tiles simply serve to give sound-resistance and to form a level ceiling, etc., and are not called upon to resist any of the stresses; being wholly within the tension area of the floor. The rods are cranked up, as in the solid floor, to provide for the reverse bending moment over the supports, and also to resist shear stresses. By the adoption of these tiles, less centering is required than with a solid floor, because boards are only needed under the longitudinal spaces between the tiles, the latter forming the intermediate centering for the top layer or fill of concrete.

Floors Constructed Without Centering.

Under certain conditions it is advantageous to adopt a system which entirely does without centering, namely, by the use of ribs or beams moulded on the bench, with tiles, blocks or slabs of terra-cotta or moulded concrete placed between these ribs to form the final support of the floor, or, more generally, to form a per-



Level Ceiling Construction
(Cross Section)

Fig. 1.

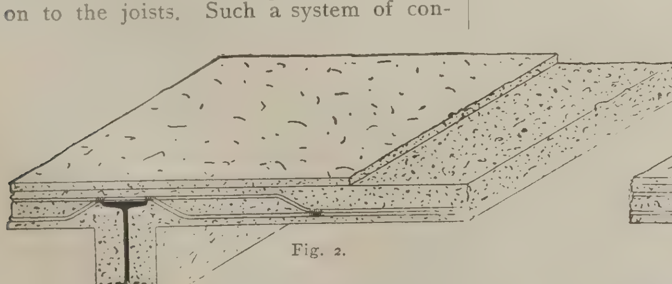


Fig. 2.

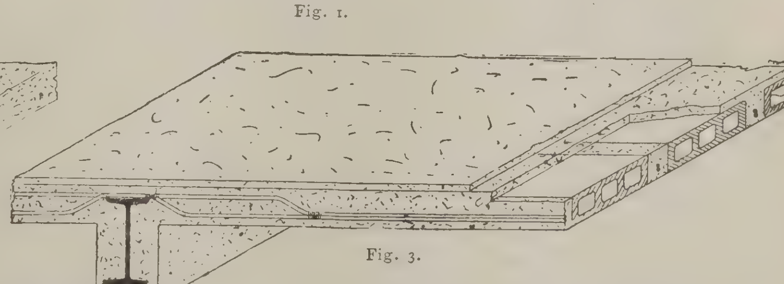


Fig. 3.

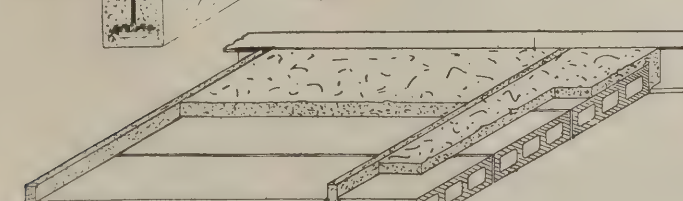


Fig. 4.

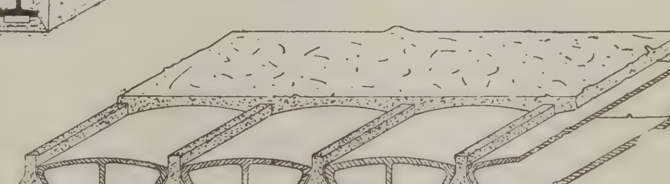


Fig. 5.

TYPES OF "U.K." REINFORCED CONCRETE FLOORS.

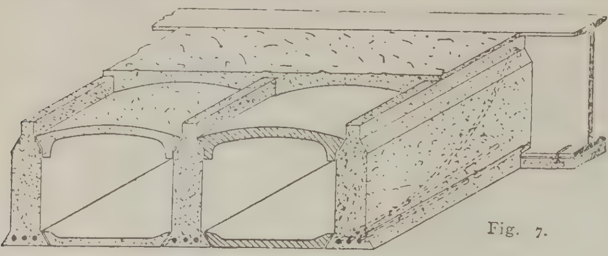


Fig. 7.

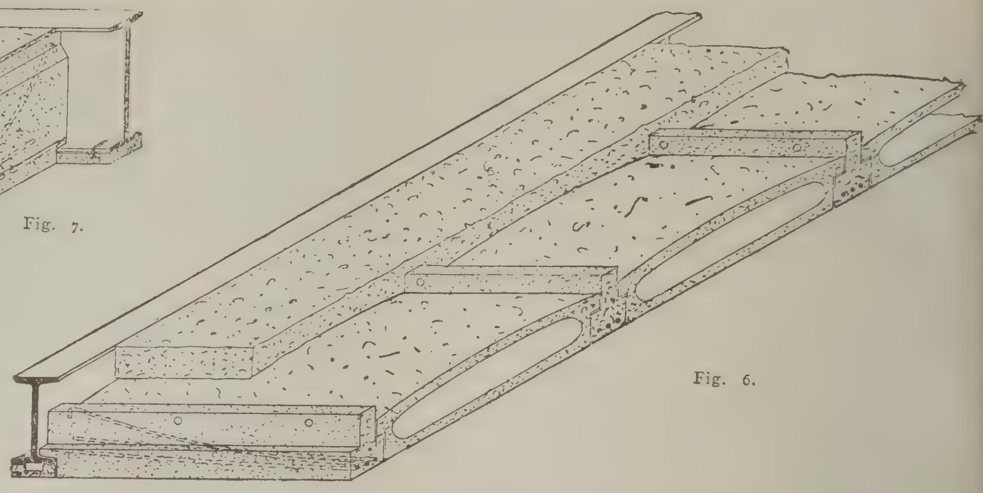


Fig. 6.

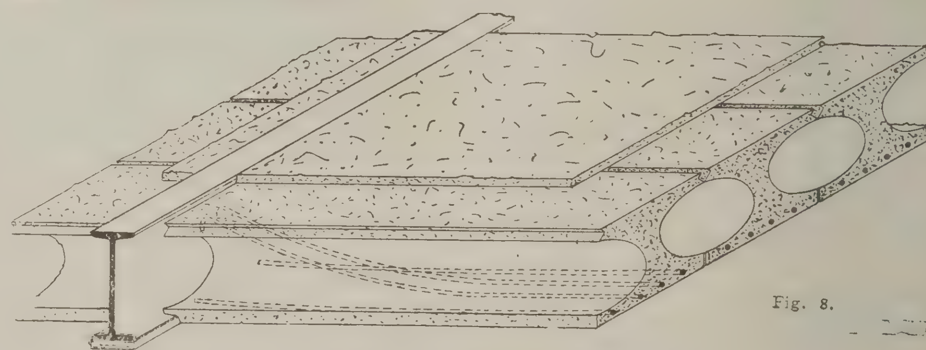


Fig. 8.

TYPES OF "U.K." REINFORCED CONCRETE FLOORS.

manent centering for a concrete top layer or filling, these blocks at the same time affording a hollow floor, which, as before mentioned, is sound-proof and non-conducting, and light in weight. Figs. 4, 5, 6, and 7 illustrate such floor construction. In each case separately moulded beams are placed between the main steel or reinforced concrete beams, with terra-cotta tubes or hollow blocks lodged thereon and between to form cavities and to support the concrete filling until set. The latter provides the compressive resistance in the majority of cases, there being adequate adhesion between the tops of the concrete beams and the concrete of the fill to make the hollow construction act together monolithically, and virtually form a T beam or ribbed slab construction.

A Light Hollow Floor.

Fig. 4 shows a light type of construction, using hollow terra-cotta slabs resting upon small ribs moulded on the bench with reinforcements in the underside. These ribs are notched at the end similar to those shown in Fig. 6, so as to rest upon the main steel beams, the soffits of which are protected by concrete soffit-tiles similar to those before referred to in connection with Fig. 2.

A Heavier Hollow Floor.

Fig. 5 shows another variety, in which a different type of hollow terra-cotta block is used. If desired, the under side of the reinforced concrete ribs can be protected by terra-cotta soffit tiles. When these are made of porous terra-cotta the highest temperatures likely to be met with in long-continued fires can be resisted with absolute safety, whereas, in such exceptional circumstances it would require a great thickness of concrete to afford adequate protection, though in all ordinary circumstances the amount of protection commonly provided is ample. It will be noticed that the type of floor illustrated in Fig. 5 gives a greater depth than that shown in Fig. 4; this, therefore, is suitable for slightly heavier loads than that in which the flat terra-cotta blocks are used.

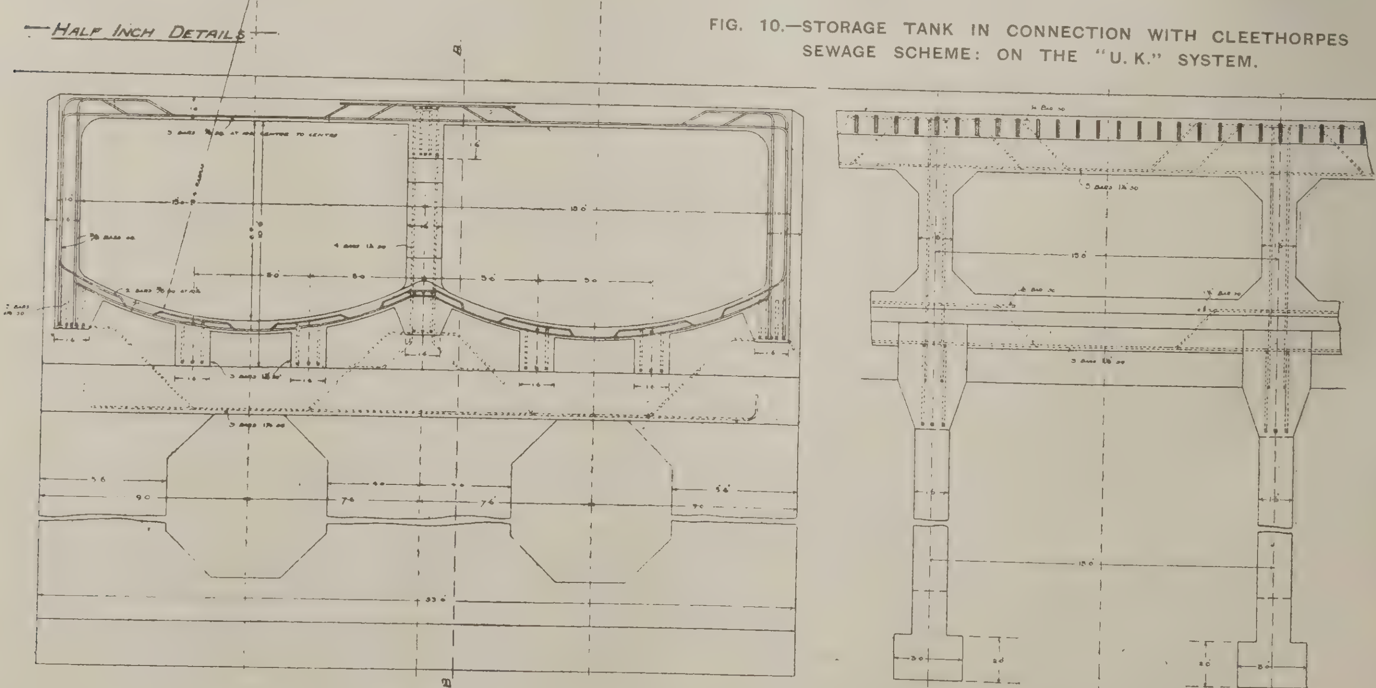
A Still Heavier Hollow Floor.

Fig. 6 shows a still heavier type of floor. In this case the moulded reinforced concrete ribs are of a different shape, and sustain hollow concrete tubes, which are cast at the works, or on the site, or made by special machinery, being either of plain or reinforced concrete, according to the width and strength required. The manner in which the reinforcing rods are cranked up at the ends to resist shear stresses is clearly shown in the figure.

Another Hollow Floor with Suspended Ceiling.

Fig. 7 shows another type of hollow floor construction, in which a flat ceiling is obtained by means of flat terra-cotta or concrete tiles laid upon projecting flanges in the reinforced concrete ribs, while the permanent centering for the concrete fill

FIG. 10.—STORAGE TANK IN CONNECTION WITH CLEETHORPES SEWAGE SCHEME: ON THE "U. K." SYSTEM.



Transverse Section.

Part Longitudinal Section on line B—B.

forming the head to the T beam construction is formed with a curved tile of concrete or terra-cotta moulded independently and not *in situ*.

A Floor of Moulded Beams Alone.

Fig. 8 shows a type of floor construction in which the under side of the floor is formed entirely by beams of concrete moulded up on the bench. These are calculated upon to give great resistance in themselves, and the concrete filling is not reckoned solely to provide the compressive resistance needed.

Advantages of the Moulded Rib or Beam.

Any of the foregoing floors with moulded ribs or beams can be quickly constructed; they afford clear head-room underneath, and allow weights to be placed upon them very soon after they are finished. They are suitable for adoption where it is desired to replace an existing floor speedily without interfering with or damaging the apartment below. Sometimes the walls of apartments have been elaborately decorated with valuable paintings, or even more ordinary forms of decorations, such as expensive embossed paper, etc., and to replace a floor with reinforced concrete constructed *in situ* would damage them irretrievably, by reason of the water and mortar dripping from the concrete. This trouble can be avoided, however, by using a floor of separately moulded beams or ribs.

Fig. 9 shows a floor of the type of construction illustrated in Fig. 1 in course of construction. This is one of the corridors of the Manchester Royal Infirmary before the concrete fill was added. The spans are 9ft., wall to wall, and 4ft. from the centre of the beams where the tubes come.

Roofs and Staircases.

The application of these systems to the construction of roofs and staircases in reinforced concrete will be obvious to the reader.

Steelwork.

The United Kingdom Fireproofing Co., Ltd., are also contractors for steelwork for roofs or steel-frame buildings, as also for partitions, asphalt, and other floor finishings. They undertake constructions of all kinds in reinforced concrete. Fig. 10 shows a design for an elevated sewage tank which they prepared recently, in which the whole construction is of reinforced concrete.

Figs. 11 and 12 show examples of work executed by the firm, the former being a view of the work in course of construction.

Theory of Design.

As regards the general theory which the company favours in the design of reinforced concrete constructions, mechanical bond bars and high elastic limit steel are not adopted, as it is considered sufficient to use ordinary commercial sections, such as rounds, square, or flats. The flats are less frequently adopted than the round rods or square bars, but in certain circumstances they can be used with advantage, as was shown in our issue for April 15th last, when we described a loading test on a floor of 24ft. span carried ou by the United Kingdom Fireproofing Co., Ltd., at their works at Perrivale-Alperton, London, W. In the majority of cases sufficient provision can be made for the resistance of the stresses met with, and to meet all ordinary conditions, without the adoption of special sections or high carbon steel, which the firm do not consider offer any advantage on the score of economy, nor as regards greater strength or safeguard in construction.

FIG. 11.—STEEL ROOF TRUSSES AT NEW TELEPHONE EXCHANGE, MANCHESTER. LEONARD STOKES, F.R.I.B.A., ARCHITECT.

The theory of calculations adopted by the company's engineers is the modern theory based upon the moduli of elasticity of the two materials, and the scientific determination of the part borne by each in the resistance of stresses, such as is adopted by the authors of nearly all textbooks and in the regulations of foreign governments and the report of the Joint Committee on Reinforced Concrete, recently appointed by the Royal Institute of British Architects. The only difference is in details. No reliance is placed upon, nor advantage seen, in using empirical formulæ. The coefficients adopted in designing as regards the strength of concrete depend upon the kind and quality,

FIG. 12.—FLOOR AT EPPS'S COCOA FACTORY EXTENSION, ON "U.K." SYSTEM.

the latter being determined by the facility and economy with which various aggregates can be obtained in different localities. With regard to the steel, ordinary mild commercial material is used, the safe strength of which is taken at 16,000 lbs. per sq. in., while the elastic limit is required to be 60 per cent. of the ultimate strength.

The great endeavour of the company seems to be to fit itself to all conditions and to execute work to suit all requirements.

Tests.

Several tests have been carried out by the company upon floors of reinforced concrete, in addition to that at Perrivale-Alperton on the floor of 24ft. span referred to above, which was a remarkably large span—indeed, so far as we recollect it exceeded that tested by any other firm.

The company not only make no secret of their designs and methods, but are prepared to give every facility for the severest tests and approval of the strength and suitability of the construction they put forward to meet any circumstances.

Fig. 12 shows a floor at Epps's Cocoa Factory. One of the panels in this floor was loaded with $4\frac{1}{2}$ cwts. per sq. ft., and the deflection was only $\frac{1}{8}$in. The span of the tested floor panel was 8ft., and the thickness of concrete was $4\frac{1}{2}$ins.

System of Contracts and Works.

The company do not sub-let work to contractors, but execute the whole of it themselves. They have works in London for the manufacture of separately moulded ribs and tubes. If the job is in the country and is of sufficient magnitude, works are started in the neighbourhood, or upon the site.

The quality of the product manufactured at works is much superior to that done *in situ*, being more uniform. By the employment of such separately moulded and cast work, not only can work be quickly and economically executed, but more dependence can be placed upon the work. Where, however, work is done *in situ* the company employ experienced hands and superintendents.

Numerous labour-saving methods are adopted at the works for the manufacture of the blocks, ribs, tubes, partitions, etc. The moulds are, in most cases, of iron, the work being moulded upon the bench, but machines are also adopted, hand tamping being used for the latter. The organisation is such as to ensure the best and most economical results.

Not only is the company under British management and founded with British capital, but the whole of the materials and labour employed are British also.

The following is a list of jobs at which the company have executed or are constructing reinforced concrete floors, and at the first seven named they have also executed the whole of the steelwork:—

Manchester Telephone Exchange
Dalston do. do.
Glasgow do. do.
Cambridge do. do.
} Leonard Stokes, F.R.I.B.A., architect.

Bromley do, do.
Chester do. do
} Bromley&Watkins, architects.

Shops, etc., Kensington: F. S. Chesterton and Son, architects.
Salford Royal Infirmary: John Ely, F.R.I.B.A., architect.
Extension to Epps's Cocoa Factory: Edwin T. Hall, F.R.I.B.A., architect.
New Joint Stock Bank, Kingsway, London: Crease Harrison and Son, architects.
New Chemical Laboratory, Cambridge: J. J. Stevenson and Redfern, Architects.
Messum's Boat-house, Richmond.
Panton Street Brewery, Cambridge: Sidney French, M.S.A., architect.

REINFORCED CONCRETE FOUNDATIONS.

Concrete has been used for the construction of foundations for many years. The first type was the solid mass-concrete foundation under walls or piers. This use of mass-concrete was later extended to the construction of entire foundation rafts of solid concrete many feet thick. At a later date came the adoption, in the United States, of grillages of steel beams for the sustaining of the great loads from steel stanchions in the steel-frame sky-scrapers which are such a feature of that country. Finally we arrived at the reinforced concrete foundation of the modern type, which is even more economical than the steel grillage foundation—itself a great advance upon the solid, plain, mass-concrete foundation. The use of reinforced concrete has been extended still further to the construction of raft foundations, and is becoming the most customary type of construction for foundation work generally. Though reinforced concrete is being thus used very extensively for foundations, the knowledge displayed in regard to the theory of their design is generally insufficient. There is room for considerable modification and improvement in current practice. We often see errors in the working drawings for reinforced concrete foundations, especially in connection with underground reservoirs or tanks. In many cases failures have occurred. The theory is not understood, and risks are often taken through ignorance on the part of specialist designers, who should have paid more attention to the subject. Perhaps the apparent simplicity of the problems has been responsible for this lack of attention. In the first place it may be mentioned that a separate foundation embodies the consideration of the cantilever, but great shear stresses are often present, of which no account is taken in the design. The square flat plate does not have quite a simple cantilever action, the stresses developed being more allied to those which would be caused in a circular flat plate acting as a cantilever; that is to say, radial as well as concentric shear stresses are present, and the reinforcement needs to be designed to resist these. Secondly, as regards raft foundations, these are stiffened with beams, but we sometimes see the reinforcement placed on the wrong side of the slab. Occasionally a double reinforcement is necessary, due to stresses of alternate kind, that may result from intermittent loading, such as in a tank or reservoir that is empty sometimes. The surging of the water load and unequal loading should also be considered in the design of such raft foundations. In the general problem of foundations also there is the question of elimination of vibration from machinery, continuous action, general stability against overturning, and independent action and resistance to earthquake shock.

The problem of foundations to retaining walls is also one of some little complexity, if not of difficulty. Several novelties have been adopted abroad in connection with foundations for various purposes, of which note should be taken by designers.

ENTRANCE GATEWAYS TO THE BELVEDERE PALACE, VIENNA.

June 24, 1908. Volume 28. No. 698.

THE BUILDERS' JOURNAL

AND ARCHITECTURAL ENGINEER.

Caxton House, Westminster.

CONTENTS.

Baroque Architecture. The term "baroque," when used with respect to architecture, is generally applied to a design, conceived in the Renaissance style of art, of which the ornamentation is more lavish and pronounced than scholarly and correct, and it is therefore synonymous with the word "rococo," which custom has sanctioned as conveying an equally expressive and comprehensive term of reproach. Baroque architecture appears to have come into vogue some forty or fifty years after the foundation of the religious movement which culminated in the formation of the Society of Jesus (by Ignatius Loyola in 1534), and its confirmation by the Pope a few years later. This particular type of Renaissance architecture is said to have been selected and popularised by the Jesuits of the 17th century, as being one that was well adapted to meet their special requirements, on account of the essentially modern characteristics it was considered to possess, but in all probability the change in architecture, as made in favour of the baroque or rococo phase of art, really denoted nothing more important than the inevitable reaction which was bound, sooner or later, to succeed the domination of the highly systematized classical style of the 16th century. The following are among the typical features of baroque architecture:—An excess of curved lines which are often broken both in plan and elevation, the frequent use of sinuous frontages and wall surfaces, broken and quaintly carved and shaped pediments, huge scrolls and shell ornamentations, and twisted columns. The enrichment of the interiors of their churches was carried to such an inordinate extent by the Jesuits that suitability and good taste were too often sacrificed to decorative profusion, and the frequent use of badly designed and weakly modelled figures and reliefs was generally unnecessarily emphasized by a mass of gilding. The salient characteristics of their architecture are to be found in many of the Jesuit churches of Italy and other parts of Europe, and these buildings may be regarded as memorials to the activity of a wonderfully well-organised and zealous brotherhood, and as evidences of the universality of its religious tenets. Of the later architects of the Italian Renaissance, most of whom worked in the style, Charles Maderne (1556-1629), Jean-Laurent Bernini (1589-1680), and François Borromini (1599-1667) are, perhaps, the best known, but it was due to the fostering care and ability of the two Viennese architects, Fischer von Erlach (1656-1723) and Lukas von Hildebrand (1666-1745), that baroque architecture was brought to its highest stage of perfection. Indeed, it is perhaps no exaggeration to say that, under the conditions in which it was used by these two great artists, the baroque ceased to be merely a debased phase of an earlier, more refined, and more scholarly art, but became a *style*. For without any sacrifice of scholarship and tradition, Erlach and Hildebrand have enriched Vienna with some of the best and most notable examples of baroque work to be found in Europe. The buildings designed by these two architects are, in fact, of so high an order of artistic merit that they more than hold their own with any structures of a similar character erected during the later period of the Italian Renaissance. But it is difficult to say precisely how this result was brought about, because, notwithstanding their originality, the architectural works of these masters of the baroque possess to a surprising extent that subtle quality of restraint which is only engendered by scholarship and tradition, and the absence of which causes architecture—in the highest sense of the word—to be non-existent. In no case, so far as we have yet been able to ascertain, has an attempt been made, in any of their buildings, to simulate originality by having recourse to the reprehensible device of distorting and misapplying the refined architectural embellishments which were bequeathed to mankind by the ancient artists of Greece and Rome. On the contrary, in the composition of the architectural designs of Erlach and Hildebrand the importance of geometrical correctness in the "setting-out" is never forgotten, the main entablatures are left unbroken, the orthodox proportions of the orders are not violated, the mouldings and enrichments are, in all essential respects, similar to those to be found in the buildings of the best period of the Italian Renaissance. And yet, mere architectural pedantry (or the scholarly application to new buildings of well-worn features of an older type of art), seems to have had but a small share in the production of designs which, paradoxical as it may sound, appear to be at once conventional in their inspiration, but untrammelled by a too close observance of tradition in their realisation. To what cause are the undoubted artistic merits exemplified in the works of these two architects of the baroque to be attributed? We venture to think that their greatness as architectural designs proceeds from that rare combination—scholarship and genius, without which no architect is able to produce buildings possessing, to use the expressive words of Wren, "the attribute of the eternal." For it is only by the laborious acquisition of scholarship that an architect is enabled to design with that full measure of strength born of the confidence he is able to feel in his own trained judgment, and it is the gift of genius alone which enables him to properly apply the knowledge he has gained, to the avoidance in his work of phases and features of art which are either well-worn and commonplace, or meretricious and ephemeral.

A "Drain" and a "Sewer" Defined at Last. The Bill to amend the Public Health Acts with respect to sewers and drains which has just been printed gets rid of that much-debated question in connection with combined drainage as to the definition of a "drain," repairable by the private owner, and a "sewer," repairable by the local authority. The legal cases on this point are as innumerable as they are conflicting, and it is to be hoped that this amendment, or clear definition, of the law on the subject will prevent all further disputes. The matter has been commented on by many of the judges. Mr. Justice Channel, in a recent case, pointed out how extraordinary was the result of this legislation "that the same structure must be repaired by the local authority if it serves the houses of one person only, but that if it serves different owners, those different owners may be required to repay the expenses of making it good"; while Lord Alverstone, in 1907, said: "It seems to be ridiculous that, if a pipe which receives the drainage of two or more houses belonging to the same owner is a sewer, it should cease to be a sewer if it also receives the drainage from another house belonging to another owner." The text of the three clauses which constitute the amending Bill is as follows:—(1) Where any person desires newly to erect or to rebuild or redrain any pair or group or block of houses, and to provide for

the effectual drainage thereof by a combined drain or drains, and shall before commencing to erect, rebuild, or redrain the same give notice to the local authority of his intention to provide one or more single private drain or drains for the purpose of draining such pair or group or block of houses into a sewer vested in the local authority, and shall deposit such plans thereof, if any, as may by the by-laws of the local authority be required, and otherwise comply with any by-laws of the local authority relating thereto, every such single private drain when constructed shall be a drain and not a sewer within the meaning of section four of the Public Health Act, 1875. (2) In any urban district the provisions of section 25 of the Public Health Act, 1875, shall be satisfied as regards such pair or group or block of houses as aforesaid by the construction of such private single drain or drains as aforesaid as may appear to the urban authority to be necessary for the effectual drainage of such pair or group or block of houses, provided that the single private drain or drains so constructed shall empty into any sewer which the urban authority is entitled to use, and which is within 100 ft. of some part of the site of such pair or group or block of houses. (3): (*a*) This Act shall be construed as one with the Public Health Acts. (*b*) This Act may be cited as the Public Health Acts Amendment Act, 1908, and this Act and the Public Health Acts may be cited together as the Public Health Acts."

Some Recent Public Buildings and Improvements in London. "The Observer" for June 7th gives a surprisingly long list of the new buildings and street improvements which have been erected, or carried out, in the metropolis during the past decade, but, as our contemporary very justly remarks, "the rebuilding of London within the past ten or twelve years is a fact more easily brought home to the occasional visitor than to the citizen who has watched the transformation proceeding slowly day by day." Among the changes thus effected in our street architecture, or thoroughfares, the following may be instanced, namely: the Queen Victoria Memorial and Processional Roadway, the new Government Offices, the new War Office, the Aldwych and Kingsway improvement, the South Kensington Museum extension, the Marble Arch improvement, the Tate Gallery, the new Central Criminal Court, the new bridges at Vauxhall and Kew, the widening of Blackfriars Bridge, the Royal College of Science, South Kensington, the new Roman Catholic Cathedral at Westminster, Victoria Railway Station (rebuilding), Charing Cross Railway station (alterations), and the Royal School of Art Needlework, South Kensington. With the erection of the Piccadilly Hotel an important and comprehensive scheme, involving the eventual reconstruction of the whole of the Quadrant in Regent Street, has been inaugurated, and other thoroughfares in which sweeping alterations have taken place are Parliament Street, Whitehall, and the Strand — in all of which plans for further improvements are still under consideration. For instance the new Government Offices, at the end of Parliament Street, are to be continued in the near future to include the whole of the north side of Great George Street; and even then, as the "Observer" says, the scheme will fall far short of the fine conception of the late Sir Charles Barry, whose plans showed a series of magnificent buildings covering the area from Millbank to Leicester Square.

Byzantine Research and Publication Fund. We have received an appeal from the honorary secretaries (Mr. O. M. Dalton and Mr. R. Weir Schultz) of the committee which has been recently formed, in association with the British School at Athens, with the object of collecting funds for the systematic investigation, record and publication of Early Christian, Byzantine, and Frankish monuments. The field of work to be covered by the scheme includes all such remains (to be found in the countries and islands of the Eastern Mediterranean) dating from the introduction of Christianity to the fall of the Eastern Roman Empire in A.D. 1453. It may interest our readers to know that valuable material upon the following interesting subjects has already been collected, namely, the Karu Dagh (Asia Minor), the churches of Constantinople, Salonika, Greece (including the Parthenon as a Christian church), Mistra, Samari, Androussa, Iegea, Christianopolis, Olympia, Carytena, Arta, Boeotia, and Euboea. For the success of the project it is necessary that a sufficient sum of money and a number of trained men should be forthcoming within a reasonable time. It is therefore proposed, in the first instance, to ask that subscriptions may be guaranteed for three years, in order to carry out a satisfactory programme, such as (a) the investigation and excavation, where necessary, of a selected number of well-known Byzantine buildings and sites, and the publication of the results; (b) the publication of at least one volume of the material already collected. We have much pleasure in bringing under our readers' notice the above details of this very excellent scheme, which has been initiated with the view of augmenting the knowledge we already possess concerning Byzantine art.

BIRD'S-EYE VIEW OF THE CHÂTEAU DE CHANTILLY, AS RESTORED UNDER THE DIRECTION OF M. DAUMET.

R.I.B.A.

Presentation of the Royal Gold Medal.

The last meeting of the session of the Royal Institute of British Architects was held on Monday evening at 9, Conduit Street, W. In the absence of the outgoing president (Mr. T. E. Collcutt), who is away in Canada on business, the chair was occupied by Mr. Henry T. Hare.

The occasion of the meeting was the presentation of the Royal Gold Medal to M. Honoré Daumet, the distinguished French architect.

Mr. Hare said that in honouring M. Daumet they desired to express their sincere appreciation of his great works as an architect, and through him also their admiration for contemporary French architecture. English architects had drawn much of their inspiration from foreign countries—more, perhaps, than they sometimes cared to acknowledge—and to no country did they owe more than to France. Perhaps few realised how much this was so, and as instances taken at random Mr. Hare cited the City of London School, Scotland Yard, and the original portion of the School Board offices—none of which we should have in their present form were it not for French influence.

Continuing, Mr. Hare pointed out that architecture in France had probably pursued a more regular and less turbulent course than it had with us in England. It had known no "battle of the styles," and no revivals—Gothic or otherwise; but, although the even tenor of its way had been marked by less strenuous feelings than with us, it was, and always had been, a living and progressive art, understood and appreciated by its public to a much greater extent than here; and it was in this intelligent and cultivated public appreciation that so much of their strength lay. The French, also, more than any other nation, had fully realised the intimate connection between the arts of architecture, sculpture, and painting, and in no country were these so happily united and so mutually sympathetic.

Of the vitality of French art in the present generation no proof was necessary, but one might be pardoned for instancing the magnificent Gare d'Orléans, Ginain's Ecole de Médecine, M. Nénot's Sorbonne, the beautiful little Chapelle Expiatoire in the Rue Jean Goujon, and M. Daumet's own work at the Palais de Justice.

Mr. Hare then proceeded to introduce M. Daumet more particularly, and gave a short *résumé* of his career.

M. Daumet was born in Paris on October 3rd, 1826; consequently, he is 82 years of age. He began his architectural career as a pupil of Blouet and Gilbert, and was awarded the Grand Prix de Rome in 1855. His principal works as an architect include the Palais des Facultès and the Palais de Justice at Grenoble, the Palais de Justice, Paris (which he carried out in collaboration with Duc), the Chapel *Ecce Homo* at Jerusalem, the Chapel and Pensionnat for the Dames de Sion at Paris and Tunis, the restoration of the Château de Chantilly for the Duc d'Aumale (of which we give a view on the opposite page), and the works at the Château of St. Germain, and at St. Pierre at Vienne. M. Daumet's work at Chantilly and at the Palais de Justice is highly esteemed by his French colleagues, by whom he is held in great honour, both for the nobility of his character and the refinement of his work. M. Daumet has been the recipient of various honours, not only from his own countrymen, but from abroad. By the unanimous vote of all the nations represented on the Permanent Architectural Congress Committee, he was elected to be their president. He is a member of the Academié des Beaux-Arts, of the Institute de France; Inspector-General of the Civil Buildings, Paris; vice-president of the Council of Architecture to the Court of Appeal, Paris. He is a commander of the Legion of Honour, and a past-president of the Societé Centrale des Architectes Français. His services on behalf of the educational side of architecture in France have been remarkable. No fewer than nine of his pupils have taken the Grand Prix de Rome, among them being M. Ch. Girault, the architect of the Petit Palais, Paris. M. Daumet was elected Hon. Corresponding Member of the Institute in 1886.

M. HONORÉ DAUMET, ROYAL GOLD MEDALLIST, 1908.

In presenting the Royal Gold Medal, Mr. Hare reminded M. Daumet of those other countrymen of his on which the same honour had been conferred—among them being Viollet-le-Duc, Charles Garnier, César Daly, and Auguste Choisy, all men of world-wide reputation, and whose work and influence live to-day and will continue in the future.

M. Daumet, who was received with great applause, replied in French, expressing his deep appreciation of the honour which had been conferred upon him, and paying a tribute to English architects and their work.

After the presentation of the Medal, Mr. John Slater proposed a vote of thanks to the outgoing president, Mr. Collcutt, expressing the thanks of the Institute for the zealous way in which Mr. Collcutt had carried out the duties of his office, and extending a hearty welcome to the new president, Mr. Ernest George. The vote was seconded by Mr. Edwin T. Hall, and carried with loud acclamation.

Mr. George then assumed the badge of office, and after briefly acknowledging his election to the position of president, declared the business of the meeting, and of the session, at an end.

SOME IMPRESSIONS OF VIENNA.—I.

By Alfred W. S. Cross and E. A. Rickards

To ancient Vienna may be accorded the proud distinction of having been, for many centuries, the most advanced bulwark of western civilisation and Christianity against their inveterate enemies the Turks. For not only did that historic city sustain the open attacks of the Mohammedans which culminated in the memorable sieges of the reigns of the Sultans Soliman II. and Mohammed IV., but as Hungary, with which Vienna was constantly at variance, retained for a long time many of its Asiatic characteristics, the Hungarians frequently received the sympathy and sometimes the secret support of the Turks during their successive struggles with the Emperors, and the city had, therefore, often to battle with unseen foes.

The Rise of the City.

The story of Vienna commences with the earliest years of the Christian era, when the Celtic settlement of Vindomina was seized by the Romans, who changed its name to Vindobona, and established there a fortified camp, to dominate the Danube, and thus protect the northern frontier of their Empire. Gradually growing in importance, the fortress became eventually a *municipium*, or town, and the seat of the Roman Government. On the decline of the Roman Empire Vindobona was overrun by successive hordes of barbarians, including Attila and his Huns, who were among the temporary occupants of the town in the fifth century.

In the sixth century the place passed into the possession of the Avars, by whom it appears to have been held until towards the close of the eighth century, when they were driven out by Charlemagne, who made the district between the Enns and the Wiener Wald the boundary of his Empire. In 976 this portion of Austria (*Ostmark*) was granted in fief to the Babenbergers, and, in 1156, during the reign of Frederic Barbarossa, Vienna was advanced to the rank of a duchy, and became the capital and place of residence of Duke Heinrich Jasomirgott, who established the citadel in 1160. During the crusades the city increased so rapidly that, on the extinction of the Babenbergers, in the days of Ottocar II., of Bohemia (1251-1276), it had extended to the limits of the present Innere-Stadt.

After the defeat of Ottocar, in 1276, by Rudolf of Hapsburg, Vienna commenced a new era of prosperity and advancement, when it thus became the capital of the Hapsburg dynasty, and participated in the fortunes of the house of Austria. Under Duke Rudolf IV. the cathedral of St. Stephen was rebuilt, in 1359, and the University founded, but misfortune was to fall upon the hitherto flourishing city, for, although unsuccessfully besieged in 1477, it was taken, eight years later, by the Hungarian King, Matthew Corvinus.

A Record of the Middle Ages.

There are many accounts supplied by contemporary writers of the fifteenth century of the architectural conditions existent in German cities of that period, but even in those days Vienna seems to have been regarded as the ideal of a beautiful mediæval town. This is shown by the following interesting description of the city, as it appeared about the middle of the fifteenth century, written by Aeneas Sylvius Piccolomini, of Siena, who succeeded, in 1458, to the papacy as Pope Pius II.: "The town is situated in a crescent on the Danube, and the city wall, which is 5,000 paces long, has double fortifications. The town proper lies like a palace in the centre of the suburbs, several of which rival it in beauty and size. Nearly every house has something to show, something remarkable in it or about it. Each dwelling has its back court and front court, large halls and smaller, and good winter apartments. The guest rooms are beautifully panelled, richly furnished, and warmed with stoves. All windows are glazed, and some have painted glass and ironwork guards against thieves. On the basement are large cellars and vaults, which are devoted to apothecaries, warehouses, shops, and lodgings for strangers. The market-places and streets teem with life. Without reckoning the children and those under age, there are 50,000 inhabitants and 7,000 students. The commerce of traders and the sums of money that are here earned and spent are enormous. The whole district round Vienna is like one vast and beautiful garden covered with grapes and apples, and studded with the most charming country houses."

But, unfortunately, there is another side to the picture upon which the future Pope also touches: "By night and by day there is fighting in the streets. Sometimes the artisans are assailing the students, sometimes the court people are

A SKETCH IN THE VOLKSGARTEN. BY E. A. RICKARDS.

THE MONUMENT TO THE EMPRESS ELIZABETH IN THE VOLKSGARTEN, VIENNA.
BITTERLICH, SCULPTOR. OHMANN, ARCHITECT.

quarrelling with the citizens, and sometimes it is citizen who has sword drawn against citizen. A festival rarely concludes without bloodshed."

In 1529 and again in 1683 (to the incalculable benefit of civilisation and Christianity) Vienna successfully withstood the fierce onsets of the Turks. In 1740 the male line of the Hapsburgs became extinct with the death of Charles VI., and the Imperial crown fell to his daughter, the great Empress Maria Theresa.

The Years of Importance.

Under the rule of Charles VI. (1712-1740), of Maria Theresa (1740-1780), and of Joseph II. (1780-1790), Vienna became, both socially and politically, the centre of the monarchy, and it was chiefly during the reigns of these sovereigns that art was fostered and encouraged.

The Academy of Arts had been founded some years before the accession of Charles VI., but it was under the influence of J. B. Fischer von Erlach (1656-1723) and Lukas von Hildebrand (1666-1745) that what is known as the Baroque style of architecture attained its most brilliant development. The passion of the Viennese for the drama and music also became well-known, and was instrumental in causing Gluck, Haydn, Mozart, Beethoven, and other well-known musicians to become more or less closely connected with the city.

To the highly-talented artist Raphael Donner (1693-1741) Vienna is probably indebted for the vigorous school of sculptural art, the traditions of which were carried on by his immediate successors, owing to whose examples and precepts Viennese sculpture still remains in a very flourishing condition.

In the early part of the nineteenth century successive wars with Napoleon, during which, after the battles of Austerlitz (1805) and Wagram (1809), Vienna was occupied by the French, retarded the material prosperity of the city.

In 1848 the Viennese, who sympathised with the Hungarians in their efforts to obtain constitutional reform, rose in arms on the departure of the city garrison for Hungary, and prepared to resist the impending attack of the Imperial army, but a few days later Vienna was taken by storm after a desperate struggle, which was attended by immense slaughter. This episode was followed by the abdication of the Emperor Ferdinand I., and the coronation of the present Emperor, Francis Joseph I., under whose reign Vienna has risen to an unprecedented greatness and prosperity. In addition to being the principal residence of the Emperor and the see of an archbishop, the city is now the meeting-place, alternately with Buda-Pesth, of the delegation and of the Austrian diet.

Vienna as it is to-day.

Vienna is divided into twenty-one municipal districts ("Bezirke"), and, unlike most European cities, the inner town (Innere-Stadt), containing as it does the palaces of the emperor and of many of the nobility, the government offices, most of the embassies and legations, the opera-house and numerous hotels, is still the most aristocratic quarter.

Of the other municipal districts, Leopoldstadt, situated on the left bank of the Danube canal, is the chief commercial quarter; Landstrasse contains the British and German embassies and other official buildings; and Mariahilf, Neubau and Margarethen are the chief centres of the manufacturing industries, while in the medical quarter of Alsergrund are to be found the huge general hospital, the military hospital, and the municipal asylum for the insane.

The inner city, with which this article is chiefly concerned, was formerly separated from the other districts by a complete circle of fortifications consisting of a rampart, fosse and glacis; but these were removed in 1858-1860, and in place of the glacis a fine boulevard, the well-known Ringstrasse, two miles in extent, and of an average width of about 150ft., has been constructed. By the terms of an agreement made between Austria and Hungary in 1867, Budapesth became the capital of the east or "Transleithan" half of the empire, and the alternative residence of the Emperor, who was thenceforth also known as the "King of Hungary." This diversion of a considerable amount of their trade and commerce was a severe blow to the aspirations of

THE VOLKSGARTEN, VIENNA.
This garden is laid out on the site of the former fortification of the city.

DRAWN BY E. A. RICKARDS.

the Viennese, and although the city has since made immense strides, it still lags behind other great capitals in some matters of municipal importance. But such gigantic civic undertakings as the regulation of the Danube in 1870-1877, the International Exhibition of 1873, the destruction of the Linien-Wall, the incorporation of the outer districts within the city proper, and the construction of the Stadtbahn or Suburban Railway, in 1893-1902, added to the earlier improvement effected by the formation of the Ringstrasse, have given an immense impetus in recent years to the development of architecture, and both in its town-planning, and in the number, size, and design of its recent buildings, Vienna can now hold its own with any other European capital.

The Architects of the City.

Of the architects who have thus assisted to beautify the city, Gottfried Semper (1803-79), and K. von Hausenauer (1839-1894), the designers of the new wing of the Hofburg and of the Imperial Museums, Theophil Hansen (1831-91), who built the Reichsrats-Gebaude, Herr Otto Wagner, who is worthily represented by his well-known stations of the Stadbahn, and by many large tenement houses and other buildings, and Fried Schmidt (1825-91), who acquired a high reputation by the knowledge of Gothic architecture displayed in his designs for the new Rathaus and for the churches of Maria Von Siege, St. Othmar, and St. Brigitta, are perhaps the best known.

The Public Parks and Gardens.

Much of the attractiveness of Vienna is due to the beauty of the large public parks and gardens with which it is so liberally supplied. Of these parks the largest, the Prater, comprises a well-wooded expanse of some 2,000 acres, situated on the east side of the city, which became the property of the Imperial Family towards the end of the sixteenth century, and was used as a *chasse* until 1776, when it was opened as a public park by the Emperor Joseph II. Here Viennese life may be studied in all its aspects.

The main road of the Prater, the Haupt-Allée, or principal avenue, the fashionable resort of the aristocracy, is two-and-a-half miles in extent. It is lined with a quadruple row of fine chestnut trees, beyond which are broad meadows and shady ponds, and extends in a straight line from the Prater-stern, which forms the spacious entrance of the three principal roads of the Prater, to the small Lusthaus, which was formerly a hunting lodge.

In the Prater-stern, on a granite column 36ft. high, relieved with ships' prows in bronze, is a statue of Admiral Tegetthoff, the hero of Lissa and Heligoland. Another portion of the Prater, known as the Volks-Prater, and the favourite haunt of the humbler classes, is much frequented in the afternoon and evening. In the Volks-Prater, shows, entertainments, and sports of all kinds are to be found, and there, in the part known as the English Garden, is the popular pleasure resort, "Venice in Vienna." Other attractions are provided by the Summer Orpheum, the Jantsch-Theater, and the great wheel. The course for trotting matches extends in front of the huge Rotunda—the chief permanent building of the International Exhibition of 1873. At the end of the Prater is the Freudenau, where the chief horse-racing takes place. The Prater possesses an immense number of open-air and other *cafés* and restaurants, and fine military bands perform daily during the summer months.

The more centrally placed public gardens, such as the Volksgarten, the Hofgarten, the Rathaus-park, and the Stadtpark, adjoin the Ringstrasse, and all possess features of great interest and beauty.

The Volksgarten.

The Volksgarten, situated on the north-west side of the Burg-Platz, was presented to the city by Francis II. in 1823. It contains the so-called Temple of Theseus, in which are now housed the treasures of classical art obtained by the excavations carried on at Ephesus, since 1898, by the Austrian Archæological Institute at Athens. To the left of the south entrance of the gardens is the Grillparzer monument, erected in 1889, designed in the form of a crescent-shaped marble screen, in which, in a central niche, is a figure of the poet. The wings of the screen are embellished with low reliefs, illustrating scenes from Grillparzer's more important dramas. In the west part of the garden is the recently erected monument to the ill-fated Empress Elizabeth, consisting of a seated white marble figure, behind which is a lofty semi-circular screen formed of marble and foliage. In

DRAWN BY E. A. RICKARDS.

front of the raised marble platform which supports the pedestal of the statue is a large rectangular marble basin, with two small fountains, surrounded by partially paved broad terraces, and well provided with marble seats, some of which are set in charming alcoves of marble and foliage. The terraces and marble platforms are bright with tulips, rhododendrons, azaleas, white lilac, and blue and white forget-me-nots, and evergreen plants placed in marble vases and tubs, or beautifully arranged in beds bordered with box, abound in profusion. The memorial is approached from the gardens by two aisle-like pathways, leading to archways of foliage flanked by marble columns supporting funeral urns, the wide intervening space being arranged in the form of a deeply-sunk grass lawn. It is as impossible to do justice, in any written description, to this extremely beautiful and poetical creation, which reflects the greatest credit upon its talented author, Herr Othmann, as it would be captious and hypercritical to complain of the existence, in a very restrained and unobjectionable form, of a *piquant* touch of "L'Art Nouveau" in some of the architectural details and sculptural enrichments of this thoroughly artistic and charming composition.

A FOUNTAIN IN THE VOLKSGARTEN.

The Stadt-park.

The Stadt-park, designed and planted in 1862, on the site of the former glacis, is another favourite summer resort of the Viennese. It contains the *Kursalon*, the curiously designed *Milchtrinkhalle*, or dairy, and some modern statuary, including the Nymph of the Danube (Gasser), the Schubert monument (Kundmann), the Emil Schindler monument (Hellmer), the Bruckner monument, and, on the terrace by the side of the small River Wein, a marble fountain group, entitled "Die Befreiung der Quelle" (The Liberation of the Spring), by Jos. Heu (1904).

The bridge approach and the embankments have been so cleverly, and in their general arrangements, so appropriately designed, as to cause a feeling of regret that the architectural details employed are those of a debased and ephemeral phase of art.

Of the other public parks of Vienna, that known as the Augarten, situated in a district which now contains extensive factories, consists of a park of 125 acres, planned in the French style, and its spacious buildings date from the eighteenth century, whilst the modern garden, known as the Maria Joseph Park, near the arsenal, occupies what was formerly waste land, and contains some fine ponds and groups of trees. An obelisk erected at the entrance records the date of the opening (1905).

Schwarzenberg Park.

The stately garden of the palace of Prince Schwarzenberg is open to the public during the summer months. Its buildings and beautiful grounds were designed by Fischer von Erlach in 1706.

The Belvedere.

Adjoining the Schwarzenberg Palace is the Imperial *château* known as the Belvedere, which was erected between 1693-1724, for Prince Eugene of Savoy, by whom it was occupied until his death in 1736. The palace, which is one of the finest edifices of its kind to be found in Vienna, was designed by Lukas von Hildebrand, and consists of two ranges of buildings, of which the smaller is known as the Lower Belvedere, and the larger, the *château* proper, as the Upper Belvedere. Placed between these two groups of stately buildings is a most attractive and beautifully planned garden, in the French style, which descends, in a series of terraces, from the upper to the lower palaces. The whole of the grounds are profusely adorned with fountains, grass plots, flower beds, and well-shaded avenues, and are further embellished by a remarkable series of sculptured figures of children, representing the twelve months of the year, by Gasser. The magnificent entrance gateways of the Belvedere gardens, with their rich and varied ornamentation, are very interesting examples of the architectural epoch in which they were designed.

(*To be continued.*)

Notes on Competitions.

An Important Competition.

An important competition is to be held in connection with the proposed extension of the Royal Infirmary at Bristol and the alteration and modernisation of the present buildings. The competition is open to all Bristol architects, and to twelve other architects, who will be selected from outside. There will be three premiums, namely, 200 guineas, 150 guineas, and 100 guineas, and the designs will be assessed by Mr. Edwin T. Hall, V.-P.R.I.B.A. Architects desiring to compete should send in their names by July 4th, together with a list of buildings carried out from their designs, to Mr. W. E. Budgett, secretary and house governor, Royal Infirmary, Bristol, from whom particulars and site plans can be obtained on a payment of three guineas, which will be returned on the receipt of a design, or on the return of the conditions within ten days.

House-building without the Architect.

Our attention is directed to two announcements inviting architects to submit designs for houses. In the one case the sum of five guineas is offered for the "most suitable" design for a country house, to cost £750. In the other case £10 is offered for designs for detached houses near London. Obviously the idea in both cases is to get designs on the cheap, and to carry out the work without the architect and without paying the fees which are due to him in the ordinary proper way of practice. Such schemes warrant being tabooed, as they doubtless will be, by all reputable architects.

Guernsey Hospital Competition.

A correspondent sends us a copy of the conditions of the competition for the infirmary proposed to be erected in connection with the Country Hospital at Castel, Guernsey. The conditions (which are in French) particularize the accommodation which is required, and set out certain details, but they contain two or three most unsatisfactory clauses. Competing architects have to take their own levels—no site plan being furnished—and designs have to be accompanied by specifications, *with details of the drainage, heating, lighting, and ventilation*; while the promoters do not undertake to accept any of the designs submitted; moreover, there is no mention of a professional assessor. Architects who have competed before under conditions of this sort, and who know by personal experience what is likely to happen, will do well therefore to avoid this competition, unless the conditions are satisfactorily revised. Designs have to be sent in by August 1st, to Thomas Robin, President des Directeurs de l' Hôpital de la Campagne, Castel, Guernsey.

School at Banbury.

This appears to be another competition with unsatisfactory conditions, more particularly in respect of the fees, into which the premium is to merge, and which are to include travelling and out-of-pocket expenses, alterations in the design, and additional drawings that may be required; moreover, a specification has to be submitted with each design, and the conditions are only obtainable on paying a deposit of one guinea, which is not returned unless a design is submitted.

Writing in regard to this matter, a cor-

respondent says:—"The Education Committee are not willing to supply a copy of the conditions to those desiring to consider them, when the £1 deposit is offered with the reasonable stipulation that it be returned to the intending competitor if he (deciding not to compete) sends back the particulars within 24 hours. Nowadays, those who enter public competitions have sufficient trouble and expense, without being obliged to forfeit £1 deposit if, after reading over a set of conditions (possibly unfair in some respect) they should decide not to enter."

New Churches at Gorseinon and Ammanford.

In the competition for a new church to be erected at Gorseinon, the design of Mr. D. Jenkins, A.R.I.B.A., F.S.I., of Llandilo, has been selected, from among sixteen designs submitted. Mr. Jenkins is also the successful competitor in the limited competition for a new church at Ammanford, for which five architects were invited to submit designs. Each church is to seat about 600 persons.

LIST OF COMPETITIONS OPEN.

Deposit for conditions given where known.

DATE OF DELIVERY.	COMPETITION.
July 1	COUNCIL SCHOOLS, DISLEY, CHESHIRE (350 places).—Particulars from F. May, Clerk to Education Committee, 43, Church Side, Macclesfield.
July 4	BRISTOL ROYAL INFIRMARY EXTENSION.—Premiums 200, 150, and 100 guineas. Limited to Bristol architects and to 12 outside architects. (Mr. Edwin T. Hall, assessor.) Architects desirous of competing must send in their names by this date, together with list of works carried out from their designs. Conditions from W. E. Budgett, Secretary and House Governor, Royal Infirmary, Bristol. Deposit, £2 2s.
July 13	EXTENSIONS TO WORKHOUSE BUILDINGS, DUDLEY.—Limited to architects practising within 35 miles of Dudley. Conditions from G. W. Coster, Clerk, Union Offices, St. James's Road, Dudley.
July 31	ELEMENTARY SCHOOL AT BANBURY.—Conditions from Oliver J. Stockton, Town Clerk, Banbury. Deposit £1
Aug. 1	COUNTRY HOSPITAL, GUERNSEY.—Conditions from Thomas Robin, President of Directors of Country Hospital, Castel, Guernsey.
Aug. 31	PARISH CHURCH AT BISHOPSWEARMOUTH.—Limited to Sunderland architects. Conditions from H. E. Hinckley, 68, Cleveland Road, Sunderland. Deposit one guinea.
Sept. 15	REFORMERS' MEMORIAL AT GENEVA (funds expected to amount to £20,000). Sketch, plans, and plaster model. Premiums £6,000. Conditions from the Secrétariat de l'Association du Monument de la Réformation, 56, Rue du Stand, Geneva.
No date.	SITE PLAN FOR COTTAGE EXHIBITION, SWANSEA, 1909.—Gold, silver and bronze medals, with prizes of £25, £15 and £10. Particulars from Henry R. Aldridge, 7, Gower Street, Swansea.
No date.	NATIONAL LIBRARY BUILDINGS, ABERYSTWYTH. — Architects desirous of competing should send designs and photographs of libraries, or similar buildings erected under their direction, to J. E. Davies, Hon. Secretary, National Library of Wales, Aberystwyth.
No date.	HOUSE NEAR LONDON.—Premium £10. Particulars from Artistic Building Co., 182, Oxford Street, London, W.
No date.	COUNTRY HOUSE, not to cost more than £750. £5 5s. for "most suitable design." Particulars from B. Greatrex, Whittimere Street, Walsall.

THE CONVERSION OF VALPARAISO INTO A FIRST-CLASS PORT is to be undertaken by a syndicate formed of the following firms, Societé de Construction des Bastignolles, Fould et Cie., and Dollfuss and Viriot (all French firms); and Erlanger and Co., Painting and Co. (both British firms). The cost of the works is estimated at £4,000,000.

Enquiries Answered.

Correspondents are particularly requested to be as brief as possible.
The services of a large staff of experts are at the disposal of readers who require information on architectural, constructional, or legal matters.

Alterations to Cottage.

BIGGLESWADE.—B.M. writes: "The external walls of a cottage are of studding covered with rough cast. Brickwork is to be substituted for the roughcast. The studs are rather thin to be shown with bricknogging. Please suggest a means of making the building more substantial, while preserving the old effect."

Why not strip existing roughcast from walls and fill spaces with bricknogging, afterwards roughcasting again, covering the studding as at present? This would preserve the effect and strengthen the building. G.

Books on Water Softening.

LEICESTER.—W.K.B. writes: "Please specify books on water-softening."

For text-books, see "Water Softening and Purification," by Harold (5s.); and "Water Softening and Treatment," by William H. Booth (Constable, 7s. 6d. net). The following manufacturers would also be pleased to send literature on the subject: The Pulsometer Engineering Co., Nine Elms Ironworks, Reading; Porter Brothers, 165, Queen Victoria Street, London, E.C.; L. Hugh Bristowe and Co., Ltd., 47, Victoria Street, Westminster, S.W.; Peter Spence and Sons, Manchester Alum Works, Manchester; Mather and Platt, Manchester; and Royles, Ltd., Irlam, near Manchester. HENRY ADAMS.

Mastic Cement for Fixing Tiles.

Referring to the enquiry under this head on page 502 of our issue for last week, the Durolite Co., of 2, Church Row, Limehouse, E., write pointing out that mastic cement is not required for fixing "Durolite" opal tiling in outdoor situations, however damp, as by reason of the nature of its backing this tiling can be safely fixed with good Portland or with Keene's cement.

Roof Tiling.

MANCHESTER.—W.W. writes: "What is the best method of fixing roof tiles in a position where they will be exposed to very strong winds? How are hips and valleys specified? What is the best spar for roughcast?"

The best method of laying tiles in such a case would be described as follows:—Cover the roofs with 1in. rough boarding and stout inodorous felt, lapped and nailed with clout nails; counterbatten, with 2ins. by ¾in. battens, nailed to boarding 12ins. apart. The tiling to be (*describe same*) laid to a 4in. gauge in a small quantity of lime and hair (just sufficient to bed tiles), fixed with stout galvanised wrought-iron pins with broad heads, on ¾in. by 1½in. strong sawn fir laths, all to be closely cut to hips, ridges, and vertical faces, and the eaves laid double with proper under-eave tiles. All verges, hips, and valleys to have tile-and-half to break joint. Bed all verge tiles in cement, and provide, in addition, a course of tiles laid flat, with ends butting, in cement, and projecting 3ins. as soffit, and point flush with cement, as sketch (Fig. 1). Put to all hips and valleys purpose-made round-end hip and valley tiles to course, and bond with general tiling. Ridge to have half-round

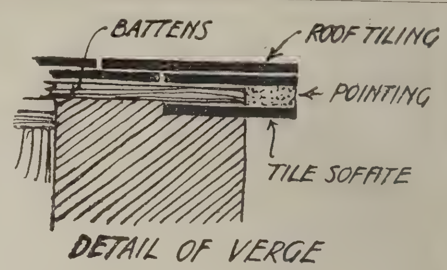


FIG. 1.

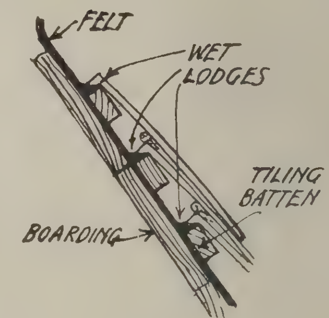


FIG. 2.

ridge tiles bedded and jointed in cement.—The counter-battening (which runs down slope of roof from ridge to eaves) is intended to allow any water that may be blown through under the tiles, to find its way downwards, rather than lodging behind each lath as sketch (Fig. 2). Proper hip-and-valley tiles make a much better job than close-cut hips or valleys, with lead soakers or gutters. The thick pointed verge prevents stripping from commencing at the free edge. (3) Derbyshire spar is often specified for roughcast, but fine gravel gives a pleasanter texture. See answer to "T.J.B.," in issue for May 13th last.

Cost of Building at Banbury.

OLD SUBSCRIBER writes: "How does the cost of building in Banbury compare with same in Bristol? For instance—What are the local materials? Is brick or stone most used, and is either easily obtainable in the district?"

Mr. A. Edward Allen, architect, of Banbury, has been good enough to furnish the following reply to this enquiry:—"Prices will be found to compare very favourably with those in any provincial town, for two reasons—labour is obtainable at a reasonable rate, and the position of the town on the G.W.R. main line, and the fact of it being also well served by the L. and N.W. and G.C. railways, provide it with first-rate facilities for transit of all building goods. There is only one brickyard (Messrs. Lamprey and Co., of Grimsby); their bricks, however (wire-cuts) are not suitable for the best outside work, and best facings, therefore, have to be imported. Lamprey's bricks are about 31s. 6d. per 1,000 delivered on site in the town. The local stone is Hornton, a capital weather stone, but varied in colour from light to dark brown, and sometimes grey. This stone is quarried at Edge Hill (of Cromwell fame), about 8 miles away. The price is reasonable (about 1s. 8d. per ft. in block delivered at Banbury), but as it is harder than Bath, it is worth at least 4s. 6d. per ft. fixed for plain rubbed work, and 5s 6d. per ft. for moulded work. The proprietors are Messrs. Mander and Son, Banbury. Banbury has a clay sub-soil, and sand cannot be procured in the town. Ordinary building sand is obtainable from Tadmarton, about five miles distant. For cement work, sand has to be imported.

Notes and News.

CANONBURY TOWER, after having been restored, has been opened as a social club. The ivy from the tower has had to be removed, as in several places it had pierced the walls, levering out masses of brickwork.

* * *

QUANTITY SURVEYORS' ASSOCIATION. — Mr. Arnold Harris, J.P., F.S.I., of Birmingham, has been elected president of this Association for the ensuing year, and Mr. H. T. A. Chidgey and Mr. R. L. Curtis, jr., have been elected vice-presidents.

* * *

AN ATTRACTIVE BOOKLET ON "SOME DUTCH BUILDINGS" in which steel windows have been fitted by the Crittall Manufacturing Co., Ltd., of 11 and 12, Finsbury Square, E.C., has just been issued. The buildings in question comprise the Royal Record Office, the National Library, tramcar sheds at the Hague, and electricity stations at Leyden and Rotterdam.

* * *

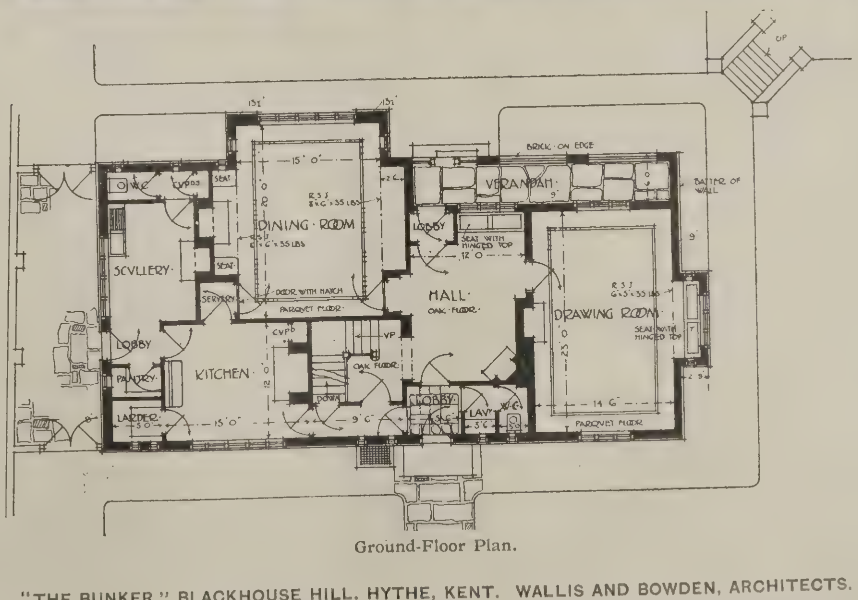
THE MEMORIAL TO DR. BARNARDO which was unveiled on Friday last by the Duchess of Albany, at the Village Home for Girls at Barkingside, consists of a granite pedestal and seat, surmounted by a group in bronze, in which Charity clasps two children to her breast. Beneath the group are a bronze bas-relief portrait of Dr. Barnardo, and a group, also in bronze, of three girls reading a book. Mr. George Frampton, R.A., is the sculptor.

* * *

THE MOST COMPREHENSIVE VIEW of London ever painted is, it is said, that which Mr. Louis Weirter, R.B.A., is exhibiting in the Hanover Gallery, New Bond Street. The picture, which measures 20ft. by 12ft., was painted from sketches made from the top of the campanile of the Roman Catholic Cathedral at Westminster; and, whatever its merits as a painting, it certainly possesses very considerable value as showing the appearance of the metropolis at a time when its architectural features are being greatly altered.

* * *

WARMING, HOT-WATER SUPPLY, and related subjects, are dealt with exhaustively in a new catalogue that has been recently issued by Messrs. Dargue, Griffiths and Co., Ltd., the well-known firm, of Liverpool, London, and Newcastle-on-Tyne, who explain and illustrate very clearly the advantages of the systems they adopt and recommend for various services, public and private, such as the "D.G." economic centralised system, with which, by using exhaust steam, what would otherwise be a waste product is utilised for heating and for hot-water supply; the "D.G." patent system of cellular floor and wall heating, which has given complete satisfaction at the King VII. Sanatorium; the low-pressure and high-pressure systems; and various methods of ventilation. On these subjects, and on electrical installations, cooking plant, and other matters, much useful information is conveyed, and in addition to the illustrations of the firm's goods, there are many views of important buildings in which these have been installed.



Ground-Floor Plan.

"THE BUNKER," BLACKHOUSE HILL, HYTHE, KENT. WALLIS AND BOWDEN, ARCHITECTS.

This house, for Mr. A. E. Mosley, stands on the crest of one of the hills encircling the quaint old town of Hythe, and commands a fine view of the sea. The disposal of the rooms on the ground floor is shown by the plan: the dining-room faces south-east, the drawing-room south-west, with a verandah on the south side. On the first floor are four bedrooms, bathroom, and the usual offices, while on the floor above are two servants' bedrooms, billiard-room, and store-rooms. The walls externally have 1½in. cement rough-cast rendering, with red brick plinth and dressings. The windows are fitted with steel casements, supplied by Messrs. Henry Hope and Sons; the sanitary fittings are by Mr. George Jennings. The contract amount for the house was £1,617. Mr. R. Grayling, of Folkestone, was the contractor, and Messrs. Wallis and Bowden, of 33, Old Queen Street, Westminster, were the architects.

CONTRACTORS' SECTION

(MONTHLY.)

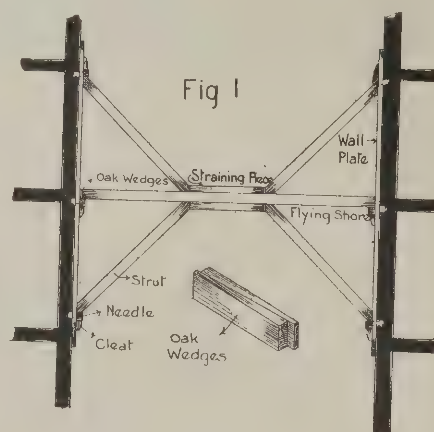
SHORING.

By Harold Slicer.

In rebuilding on a site between existing buildings the contractor is confronted with the problem of providing adequate support to walls abutting on those to be pulled down.

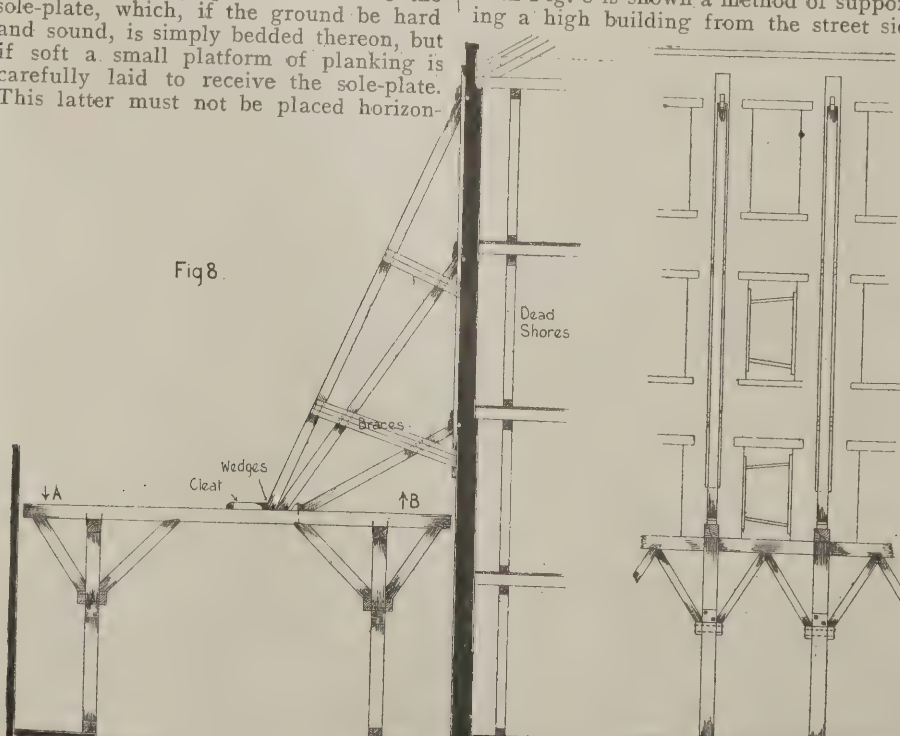
When the width of the old building is not great, though the height of the adjoining property be considerable, the case is readily disposed of by using one building to support the other, as shown in Fig. 1. At convenient places in the adjoining walls, and just under or over the floor levels, half-bricks are taken out. A wall-plate is then placed in a vertical position over them, with corresponding holes cut through it, and "needles" inserted. Against the heads of these needles—which in turn are supported by cleats—the ends of the struts abut, the struts and shores proper being driven up tight by folding oak wedges.

The case of buildings of different heights is indicated in Fig. 2. The figure shows the method adopted, the main difference being that an inclined strut runs from the one wall to the other. Where the distance between the adjoining properties is too great for such horizontal struts, raking shores are used. Such shores, shown in Figs. 3, 4, and 5, are usually inclined at angles from 60 to 75 degrees. The less the angle contained between the wall and the shore the greater the thrust on the needles, and the value of support given to the wall by the shore is less, for it is apparent that as the wall to collapse must at first move outwards in a horizontal direction, so the greatest resistance value is obtained from a strut acting along the same path (horizontally) as the flying shore. In raking shores the ground is first prepared to receive the sole-plate, which, if the ground be hard and sound, is simply bedded thereon, but if soft a small platform of planking is carefully laid to receive the sole-plate. This latter must not be placed horizontally on the ground, but more nearly at a right angle to the shores. Upon this the raking shores rest, their abutting ends being cut to bed properly upon the sole-plate, and secured thereto by means of wrought-iron dogs. The several struts are placed together, driven up tight by means of the oak wedges, and then hoop iron is wrapped round their bases (as shown) and nailed thereto, the braces being fixed and nailed in position as final ties.

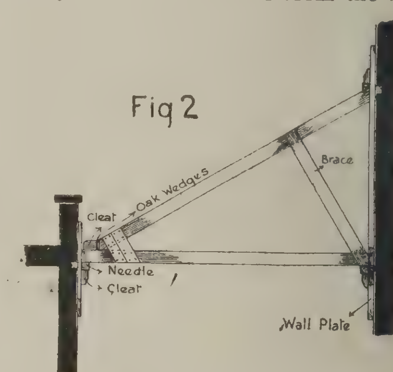


Comparing two methods of connecting the upper end of the shore with the wall-plate, in Fig. 6 it is seen that the needle has no shoulder to bear against the wall-plate, such as has the needle in Fig. 7, so that the shore end might move out sideways in the former, while no movement can take place in the latter, on account of the notched shore head, while the wedges of the former are at a considerable height from the ground, and not so readily accessible as in the latter.

In Fig. 8 is shown a method of supporting a high building from the street side



when (1) the roadway must be kept open for traffic which involves headroom as well as width for carts; (2) when the buildings opposite are weak and in bad condition, and cannot be used to support flying shores; and (3) when the causeway is too narrow to enable raking shores to be fixed. Dead shores are erected on both sides of the road at the edge of the pavement and connected together by heads at right angles and parallel to the road, supported by struts resting on cleats bolted to the dead shores. Upon the upper heads rest the raking shores which support the building. As the thrust of the building is outwards, the tendency is for the whole framework to move towards the left. Now, if the ends of the raking shores rested at A the tendency would be for the end B to rise and lift the dead shores there from the ground. It is therefore necessary that the lower ends of the raking shores should rest on the head between the dead shores. The floors of the building are supported by dead shores with heads and sills placed at right angles to the floor joists, all being placed directly above one another from the basement upwards and near to the wall, the window openings being also strengthened by struts and plates.



It is often necessary to remove the lower part of a wall without disturbing the upper portion and any floors supported therefrom. In this case openings are first made by removing some of the bricks or stonework above the floor level. Timber needles are placed through these openings, the ends being supported by means of dead shores, and holes are cut in the floor to allow the inner dead shores to pass through. The lower ends of these dead shores rest on a sole-plate. Oak wedges are then driven between the sole-plate and dead shores to tighten up the whole, and transmit the weight of the wall to the shoring. The floors are then supported by shoring, as shown. The wall beneath the needle can now safely be removed. If a steel joist is to be inserted to carry the floor, it is placed in position at the correct level, the portions of walling to support same re-built, and beam stones inserted; the walling laterally between the needles and vertically between the old walling and top of joist is then rebuilt, and the mortar allowed to set. The wedges at bottom of dead shores are eased to allow the load to come on to the inserted walling and steel joist, and finally

the dead shores are taken right away, and the needles removed, the walling then being made good where the needles have been. The dead shores to floors are taken out last of all after the whole of the new work has had time to set properly, and the floor made good.

The stresses are easily calculated, as the dead shores are simply pillars with flat ends, and the needles act as beams supported at the ends, and bearing a concentrated load due to the weight of the portion of walling above, with the additional weight from the higher floors; the first floor, of course, not being counted, as it has its own supports.

The crushing strength in lbs. per sq. in. of red deal is 5,850 average; pine is 6,000 average; fir, spruce, is 6,500 average; and the safe load can be taken at 1-5th of this.

If W = breaking weight in tons.
L = length of column in feet.
D = least transverse dimension of column in inches,

then for flat ends for a red deal column

$$W = 7{\cdot}81\frac{D^4}{L^2}$$

and 1-5th of this = the safe load in tons. As the red deal has the least crushing strength, this formula can be used for other timbers, and then gives a higher factor of safety.

C. H. Stock gives the following list of shores used in each system:—

Height of Wall. Feet.	No. of Shores. Inches.	Scantlings of each shore. Inches.
15 to 20	2	5 × 5
20 ,, 30	2	6 × 6
30 ,, 35	3	7 × 7
35 ,, 40	3	8 × 8
40 ,, 50	4	9 × 9
50 upwards	4	12 × 9

If Q = the overturning force,
P = force due to weight of wall above shore,
F = the resistance to compression in shore,
W = weight of wall (all in cwts.),
T = thickness of wall at ground in feet,
H = height of head of shore above ground in feet,
θ = angle of inclination of shore and horizon,
W = weight of shore in cwts.,

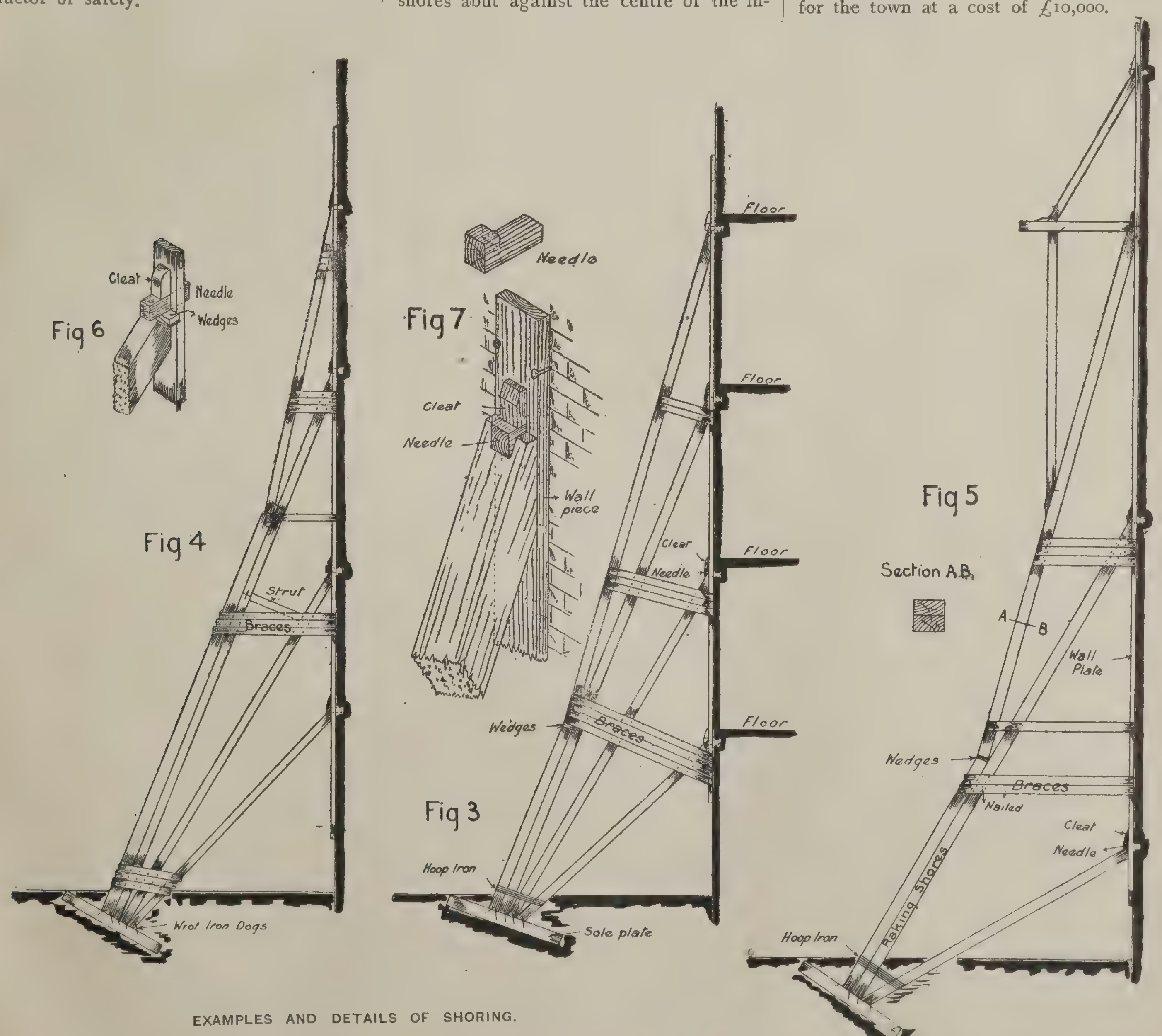
then $Q = \frac{W \times T}{2H}$, $P = Q \operatorname{Tan}\theta - \frac{W}{2}$, $F = P \operatorname{Sin}\theta + Q \operatorname{Cos}\theta$.

The distance apart of shores should not be more than 15ft., but as window openings generally occur in the walls the shores abut against the centre of the intervening piers, which then decide their distance apart.

The engineer or architect usually specifies a minimum size for dead shores, and the contractor utilises any timber he has in stock which is equal to, or of greater girth than, that specified, but the materials for raking shores are generally left until the work is commenced, when the sizes and number of the shores are agreed upon according to the contractor's stock, old floor beams, or roof timbers often being used for such purposes. It follows, therefore, that the outline the shoring takes is such that these may be employed. For instance, in Fig. 4 the lower portion of the outer shore (which represents a practical case, as also Fig. 5) was a baulk of timber of greater scantling than any other used on the same job, and the shoring shown in Fig. 5 was composed of timbers lap-jointed and screwed together, and placed side by side, as shown in section AB. The braces were pieces of old floor boards which were quite sound.

(To be concluded.)

ART GALLERY FOR SWANSEA.—By 27 votes to 6, the Swansea Town Council have decided to accept an offer by Mr. Glyn Vivian to provide an Art Gallery for the town at a cost of £10,000.



EXAMPLES AND DETAILS OF SHORING.

THE YORKSHIRE FEDERATION OF BUILDING TRADE EMPLOYERS.

The monthly meeting of the Executive Council of the above Federation was held at York on June 18th, Mr. J. Biggin (president) being in the chair, supported by 45 delegates from the local associations.

Workmen's Insurance.

Attention was drawn to the action of some representatives of insurance companies classifying certain risks (painters, for instance) as builders, and charging a lower premium in consequence thereof. It is more than questionable whether this creates a legal insurance, and members falling in with this suggestion are carrying a serious responsibility in the event of a claim arising. Members were reminded that there are no days of grace under Workmen's Compensation policies, and that it is necessary to arrange for reinsurance before the present policy expires, otherwise they are carrying their own risk, and are not entitled to indemnity if a claim should arise.

Form of Contract.

A letter was read from the secretary of the National Federation, stating that the Federation and the Builders' Institute had not yet been approached by the Royal Institute of British Architects with respect to the revision of the national form of contract. Attention was drawn to the application of the Royal Institute for grant of a supplemental charter, and it was resolved to request the Parliamentary Committee of the National Federation to consider whether the application does not afford a suitable opportunity for the incorporation of a clause making it obligatory on all members of the Institute to use the approved form of contract for all contracts, and also for the recognition of any other procedure which they are of opinion should be placed on a uniform basis.

A draft letter to be sent to local architects was submitted, and, after consideration, was referred back for amendment.

Local Areas.

It was reported that definite arrangements with respect to local areas had been mutually agreed upon by the following associations:—Bradford, Halifax, Huddersfield, Leeds, Morley, and Sheffield. The matter was receiving attention in the case of Barnsley and Dewsbury, and replies have not been received from the other associations.

Bradford Carpenters and the Conciliation Board.

It was reported that the Bradford operative carpenters had withheld the appointment of two representatives on the Shipley Conciliation Board until they were supplied with a list of the names and addresses of the members of the Shipley Building Trades' Association. The secretary was instructed to give notice to the operatives that if the appointments were not made at an early date, the attention of the Northern Centre Conciliation Board would be drawn to the default.

Manchester Joiners Dispute.

The president reported that a meeting of the National Conciliation Board had been held in London on May 26th to hear a dispute arising from Manchester joiners with respect to wages and conditions of labour. After consideration the Board decided to defer the matter six months in order to enable employers and employees to come to an agreement if possible.

The president reported the result of cases heard by the Northern Centre Conciliation Board, and stated that a further meeting was to be held on June 29th.

Local Conciliation Boards.

A letter was read from the Sheffield Association calling attention to the advisability of local conciliation boards discussing without prejudice any matters of importance which may be brought forward by the operatives, even though the matters of the reference may not strictly come within the area or jurisdiction of the Board. The matter was felt to be of great importance, and it was unanimously resolved that, as the Council of the Federation is very desirous that the local conciliation boards shall be effective in the settlement of disputes, they strongly recommend that the Boards be used for the consideration of any matter of trade interest outside their area or jurisdiction on the written application of the parties concerned that the matter in dispute be submitted to the Boards as arbitrators.

No Deputation in Regard to the Building Accidents Bill.

The chairman gave a report of a meeting of the Administrative Committee, and stated that the Home Secretary could not see his way to receive a deputation with respect to building accidents; also that arrangements had now been completed with respect to a trade journal, the same to take effect from January, 1909.

Difficulties with the Bradford Brickmakers.

Mr. Holroyd, on behalf of the Bradford Association, explained the difficulties which had been experienced by members of the Association arising out of the attitude adopted by the Bradford Brickmakers' Association. The matter was referred to the Emergency Committee for consideration and determination. A committee was appointed to meet a member of the York Association, and to advise him on a trade matter on which he was being put to some anxiety, with the possibility of considerable expense.

The Excursion to Belgium.

It was reported that facilities would be given for ladies to be included in the excursion party for Belgium, and that applications should be made to the secretary of the Sheffield Association, Mr. T. Smith, the Builders' Exchange, Cross Burgess Street, Sheffield, from whom full particulars may be obtained. The return fare and hotel expenses for the week will be about £3 10s.

Forthcoming Arrangements.

The Federation most cordially accepted the invitation of Mr. Eshelby, the president of the Sheffield Association, to hold the next meeting in that city on July 18th. Mr. Robinson, on behalf of the Bridlington Association, gave an invitation to the Federation to hold the August meeting in that town, and it was unanimously resolved to accept the same. An invitation was received from the Grimsby Association to hold the September meeting in that town, but it was left over for consideration at the next meeting, in the hope that some representatives from Grimsby may be present at Sheffield.

GOVERNMENT AFFORESTATION SCHEME. - The Coast Erosion Committee, which had decided to visit Holland, Belgium, Scotland, and Ireland in the autumn, has been requested by the Prime Minister to postpone its visit in order that its report on afforestation, a subject which was recently added to the scope of its inquiries, may be laid before the Government in October. This points to the preparation of a scheme for finding work for the unemployed on afforestation during the coming winter months. The scheme has the approval of Mr. John Burns, who has obtained the consent of the Cabinet to a scheme of afforestation on a large scale.

THE PORTLAND CEMENT TRADE.

Although naturally somewhat more active than a few months ago, it cannot be said that the Portland cement trade at present is as brisk as manufacturers would like it to be, but, amongst those best qualified to judge, an opinion is strongly held that an improvement, and probably a substantial one, will take place at an early date. This opinion appears to be based very largely on the belief that we have before us a long period of cheap money which will induce municipalities, harbour boards, and the like, to raise fresh money on favourable terms for the necessary works which have been hung up for many years past, not only in this country, but in many parts of the civilised world. Already during the past few weeks a number of important municipalities have issued new loans on the London market, and these will doubtless be followed by many others almost immediately. The effect of cheap money will also be felt in the general building trades, which have been in a languishing condition for so long. Meanwhile, prices for cement show no improvement, but it is obvious that with any increased demand which should follow the improved conditions, the present exceedingly low prices will not prevail.

The Increasing Use of Reinforced Concrete.

Another factor to be taken into account is the increasing use of reinforced concrete in all forms of building and constructional works; to mention only one instance, we might refer to the extraordinary advance which is being made in all parts of Central Europe in the use of reinforced concrete for conduits, both water and main drainage, and, above all, for electrical purposes. The advance which has been made in this direction during the past two years in particular has been quite phenomenal, and there seems to be a consensus of opinion that reinforced concrete is an improvement, both economically and practically, upon what has previously been used.

The recent formation of the Concrete Institute will doubtless result in a great deal of progaganda work being carried on under the auspices of that body, and it is bound to have a marked effect on the development of the industry in this country.

The Panama Canal Contract.

It is of interest to report that tenders for the supply of Portland cement to the Panama Canal Commission have now been opened, although no contract has yet actually been placed. As is well known, this contract is the largest ever placed in the history of the industry, and it will be a source of satisfaction to the readers of this journal to know that, although the contract has been keenly competed for by leading manufacturers all over the world, the principal firm in the cement trade in this country, namely, the Associated Portland Cement Manufacturers, is bracketed with a German firm as the lowest. Whether this firm will succeed in securing any portion of the contract is open to some question, as, for purposes of comparison with American quotations, the United States duty is added to the European figures, although, as a matter of fact, no duty is payable. With the duty (which is considerable) added to the A.P.C. price, several of the American quotations are somewhat lower, and in these circumstances the business will probably be secured by them.

Law Cases.

RESPONSIBILITY FOR A CONTRACT. — At Leicestershire assizes, Hollis Bros. and Co. and W. G. Simons recently brought an action against John Thomas Biggs for £250 for materials supplied and work done in the course of the erection of the Dominican Convent, Dane Hills, Leicester. It appeared that the plaintiff Simons was a carpenter and joiner, while the defendant Biggs was a sanitary engineer and plumber, a member of the Leicester Town Council, and a Justice of the Peace. In May, 1905, two ladies, Dominican Sisters, were anxious to build a Convent, and employed Mr. Stockdale Harrison, a well-known architect, to prepare plans. The contractor was Mrs. Mary Martin, whose husband had been a builder. At Mrs. Martin's request Simons sent in an estimate for the woodwork. The work was begun about July, 1905, and the contract, which was for £6,594, included £1,885 for Simons. The contract, however, was subsequently reduced to £4,870. During the progress of the work, Simons did not receive the full amounts due to him. When he found that he was £210 short of what he ought to have received, he refused to do any more work until the sum was paid. Simons then saw Biggs, himself a sub-contractor on the job, who told him that the other sub-contractors would soon come to a standstill unless the carpenters were re-started. Simons said he could soon have the carpenters back if the amounts owing were paid him, which had now been reduced to £145. Thereupon an arrangement was made by which it was alleged defendant was to pay the back money. He also promised to pay future amounts certified. Simons, knowing Biggs to be a substantial man, recommenced work. Biggs had a present and prospective interest in the contract, and it was alleged by plaintiff's counsel that although Mrs. Martin remained the nominal contractor, Biggs practically made himself manager of the job, and gave orders and superintended the work. From time to time he made payments to Simons. In the final certificate there was a sum of more than £300 allocated to Simons, who did not, however, receive a penny of it. Hollis Bros, timber merchants, came into the affair through Simons having assigned them £250 of the money that might become due to him. The plaintiff's case was that Biggs had become virtually supervisor of the contract, and made himself personally responsible to Simons.—The judge said that the only question was the contract made between Biggs and Simons.—Plaintiff's counsel agreed, and handed in correspondence and receipts to show that Biggs was the person upon whom Simons' claim rested. — Plaintiff corroborated his counsel's statement. In an interview with Biggs directly after he had stopped work on the building, defendant said, "If I pay you the money due to you, and also the amounts Mr. Harrison certifies for, will you go on with the work?" Plaintiff said he would, and Biggs thereupon promised to pay him. He subsequently received accounts from Biggs, and made no further application for moneys to Mrs. Martin. In February, 1907, he heard that Biggs denied liability for the amount then owing to plaintiff and he at once consulted his solicitors. In September, 1906, Biggs wrote a letter for plaintiff to take to his (plaintiff's) bankers, who were pressing him, in which he stated: "I very much regret to say that the long-promised cheque for the Convent has not yet arrived, although I am expecting it by every post. It was promised faithfully for the end of this week. Under these circumstances, I have written Mr. Simons a cheque for £50 on account, which, of course, will be deducted from the amount due to him when the Convent cheque arrives." That letter was written by Mr. Biggs, because the bank was pressing plaintiff, who did not understand from that letter that Mr. Biggs was not responsible for the amounts which became due under plaintiff's agreement with Mrs. Martin.—For the defence it was contended that all Mr. Biggs did was to offer to find money so that the work might go on, provided that when the building owners paid on the architect's certificate the money should come to him for distribution. The receipts showed that all the moneys paid by Mr. Biggs were paid on behalf of the contractor. This was further evidence that Mr. Biggs was not personally responsible. Mr. Biggs had acted in the common interest of all the sub-contractors, and it was most unfair that the plaintiffs should attempt to hold the defendant personally responsible for this debt.—Mr. Stockdale Harrison, the architect of the Dominican Convent, said he always regarded Mrs. Martin as the contractor, and she had a considerable share of the work right up to the end. He never regarded Mr. Biggs as one who had taken over Mrs. Martin's responsibility as contractor.—The jury returned a verdict for the defendant, with costs.

LEAD-POISONING: NEW COMPENSATION POINT.—At Bow County Court on Friday last, Judge Smyly gave a reserved judgment in a case under the industrial diseases sections of the Workmen's Compensation Act, concerning a deceased painter who had been in the employment of an East End firm. The man died from granular disease of the kidneys, and this, his Honour found, was a sequel to lead-poisoning. It had been argued, he said, that the sub-section of the Act dealing with workers in lead, or any of its preparations or compounds, applied only to those employed in factories, but he could not accept this view. It would be a very peculiar thing if the Act limited lead-poisoning to factories, in which a painter was seldom employed. He gave an award of £260 in favour of the deceased's widow and children, with costs. A stay of execution was granted.

Builders' Notes.

PROPOSED GENERAL HOSPITAL FOR PUTNEY.—Plans have just been adopted for the erection of a general hospital at Putney to cost £16,000.

* * *

THE DANGERS OF LIGHTLY-CONSTRUCTED STEEL-FRAME BUILDINGS.—At the annual meeting of the Association of Professional Fire Brigade Officers held at Birmingham on Thursday last a resolution was passed calling the attention of the building committee of municipalities to the dangers of lightly-constructed steel-frame buildings of great height in congested areas.

* * *

THE CLOCK TOWER OF BIRMINGHAM UNIVERSITY.—The tower which is being erected at the new University buildings at Bournbrook, Birmingham, is to have a clock and bells, the gift of Mr. Thomas Rowbotham, the well-known Birmingham contractor. It has been decided that the clock shall be placed at an elevation of nearly 200ft. The dial is to be 17ft. in diameter, and is to be illuminated at night. The quarters will be chimed on four bells, and the hour will be struck on a much larger bell, which will weigh five tons, and will consequently be of an unusually deep tone. It may be noted that the height of the tower at present is about 150ft. When completed it is intended to be 325ft. over all. Sir Aston Webb, R.A., and Mr. E. Ingress Bell, F.R.I.B.A., are the architects.

* * *

A NEW EXETER HALL is to be built on a central site near that of the old Exeter Hall in the Strand, at a cost of £20,000. The building is to be ready for the holding of the "May meetings" of 1910.

* * *

THE NEW KING EDWARD VII. HOSPITAL FOR WINDSOR AND ETON, now in course of erection, is expected to be ready for occupation in September. It is constructed on the Frazzi system.

* * *

MARKING THE BUILDER.—At last week's meeting, the Plymouth Borough Council passed the following resolution:—"That in all cases where the borough surveyor finds it necessary to condemn mortar or other building material the names of offending builders shall appear in the Council minutes."

* * *

PRESTON JOINERS' DISPUTE.—At a meeting of the Northern Centre Building Trade Conciliation Board held on June 15th the dispute between the joiners and employers at Preston was considered, and it was agreed to advance the joiners' wages from 9d. to 9½d. per hour. A Rochdale dispute was adjourned for a fortnight.

* * *

THE NORTH OF ENGLAND COTTAGE EXHIBITION at Walker, Newcastle-on-Tyne, was opened yesterday, and will remain open until October. It is the largest cottage exhibition since that held at Letchworth in 1905, and is the second of the series organised by the National Housing Reform Council. Next year there will be one as Swansea.

* * *

NEW TOWN HALL AND MUNICIPAL OFFICES FOR GIRVAN.—At a special meeting of Girvan Town Council held last week, a letter was read from Mr. John McMaster, banker, of The Holt, near Canterbury, offering to erect at his own expense a town hall and municipal offices, retaining and embodying the old town steeple as an integral part of the design. The offer was accepted. The work is estimated to cost £7,500.

* * *

SOUTH SHIELDS MUNICIPAL BUILDINGS, which are now nearing completion, were recently visited by about fifty members of the Northern Architectural Association, who were conducted over the works by the architect, Mr. E. E. Fetch, of London, and by Mr. H. A. Yeoman, representing the contractors, Messrs. Neill and Son. The party were afterwards shown over the public baths and washhouses, of which the architect is Mr. J. H. Morton, who, after the visit, entertained the party at tea at the Golden Lion Hotel.

* * *

BUILDING TRADE PROSPECTS AT GLASGOW.—The following letter over the signature of "Common Sense" has appeared in the "Glasgow News":—"I can see nothing in the future but a prolonged

depression in the building trades so long as the present spirit animates the unions. The ridiculously small reduction of ½d. per hour will do nothing to induce fresh speculation in buildings. The unions mean to place themselves above the law of supply and demand, and have thus created an artificial scale of wages. To show how this attempt injures other classes of workmen, there are quite a number of both masons and joiners working as labourers in tube works and elsewhere at 20s. per week, rather than accept 30s. at their own trade. This arrant folly not only injures themselves, but labourers, who have no union so determined to protect their interests. I remember when the City Bank failed, masons and joiners' wages suddenly dropped from 9d. to 5d. per hour, which they were forced to accept. But the very fact of their accepting the wages which they could get paved the way for a better state of things, and the building trades gradually improved. In the face of the many thousands of empty houses, I don't see any inducement for parties to risk their capital, and I should like to know where these men expect the improvement of the building trade to come from. Sanity points the only way, and that a much further lowering of the wages."

* * *

THE CAVENDISH LABORATORY EXTENSION AT CAMBRIDGE, which was opened by Lord Rayleigh last week, has cost about £8,000. The front, to Free School Lane, is of Weldon stone, with Ancaster dressings. The architect was Mr. W. M. Fawcett, of Cambridge, who also designed the original building, and the extension made in 1896. The builder was Mr. W. Sindall.

* * *

THE BUILDING TRADE AT NOTTINGHAM.—Beyond a little private enterprise in house building and works that are already well advanced, nothing has come to the material relief of the building trade. Rapid progress continues to be made with the erection of the new Hippodrome at the corner of Goldsmith Street, and Messrs. Fish and Sons have the building of the new County Council schools at Radcliffe well in hand.—"Nottingham Daily Express."

* * *

THE NEW BLOCK OF GOVERNMENT BUILDINGS at the southern end of Whitehall, between Charles Street and Great George Street, is now nearly completed, and will be "handed over" in less than a month. It will be remembered that the architect, Mr. Brydon, died when the work was only just begun, and that Sir Henry Tanner was then entrusted with the architectural supervision. Messrs. Mowlem and Co. made the foundations, and Spencer, Santo and Co. built the superstructure. The exterior is of Portland stone, supplied by the Bath Stone Firms, Ltd. An illustration of the interesting group of statuary by Mr. Paul Montford on the bridge connecting the new building with the old block was given on page 396 of our issue for May 6th.

* * *

WESTMINSTER'S PUBLIC BATHS were under discussion in the course of a recent Local Government Board enquiry relative to the proposed disposal of the lease of the Orange Street Baths site. Mr. John Hunt, the Town Clerk, stated that there was a loss of more than £10,000 a year on the five public baths in Westminster. Small dwellings were fast disappearing, and large buildings going up, so that the demand for public baths was decreasing. The ratable value of Westminster, he added, had increased by more than a million sterling since 1901, and the change that had come over Westminster during the past ten years was unparalleled in the history of London. It was stated that Sir Thomas Brooke-Hitching had made a good offer for the Orange Street site.

* * *

AN ART GALLERY OVER LOCK-UP SHOPS is proposed for Hull, in connection with the new city hall; and at the enquiry held by Major J. Stewart, R.E., into the corporation's application to borrow £3,000 to be spent in finishing the work, the inspector raised a question as to the safety of the gallery in such circumstances. The town clerk expressed the corporation's opinion that there were sufficient safeguards. Of the £3,000 required, £1,000 goes for extras necessitated by the nature of the subsoil under the hall, where concrete piling had to be employed.

* * *

SPENCER, SANTO AND CO.—The shareholders of this well-known firm of building contractors will learn with surprise that the profits of the undertaking suffered a further falling off in 1907. To the difficulty of severe depression in the building trade was added that of a reorganisation of the business, consequent on the death of the managing director. The net surplus secured was only £6,600, as against £15,500 in 1906, while, owing to the smaller account brought in, the disposable total was £12,000 to the bad at £7,900. Last year the Ordinary dividend was reduced from 10 to 6 per cent., and the carry-forward from £4,400 to £1,200, after the appropriation of £5,000 to reserve. On this occasion it is impossible either to pay a dividend on the Ordinary shares or to make any addition to the reserve fund.

* * *

ARBROATH WATER SUPPLY, of which the new works were inaugurated last week, has its intake works immediately above Glengoil reservoir, which was formed by constructing a concrete dam across the Noran Valley. The top water level is 767ft. above Ordnance datum. For about half a mile the main conduit is a fireclay pipe 18ins. in diameter; then cast iron pipes 12ins. in diameter. Twelve miles from the intake is Framedrum service reservoir, the top water level of which is 427ft. above Ordnance datum, where three days' storage is provided. From the intake on the Noran Water to the burgh boundary is 22 miles. Glengoil reservoir intake works and piping were constructed by the corporation staff, with Mr. William Duncan, of Glasgow, acting as supervisor. The remaining works were carried out under contractors—Mr. R. C. Crawford, Uddingston; Mr. Robert Gibson, Glasgow; Messrs. McLaughlin, Anderson, and Mann, Glasgow; and Mr. John Bryce, Whitburn. The cost of the undertaking has been £87,000. The engineers for the scheme are Messrs. Crouch and Hogg, Glasgow.

FORTHCOMING SANITARY CONGRESS AT CARDIFF.

The twenty-fourth congress of the Royal Sanitary Institute is to be held at Cardiff from July 13th to July 18th next. The Earl of Plymouth will preside.

There will be two sections, namely, (1) "Sanitary Science and Preventive Medicine," presided over by Dr. D. S. Davis, medical officer of health for Bristol, and (2) "Engineering and Architecture," presided over by Sir Henry Tanner, while of the eight special conferences to be held, there will be one of "Engineers and Surveyors to County and other Sanitary Authorities" (presided over by Mr. A. E. Collins, M.Inst.C.E., City Engineer, Norwich), and another of "Sanitary Inspectors" (presided over by Mr. G. H. Anderson, chairman of the Central Executive Council, Sanitary Inspectors' Association).

The following are among the subjects set down for discussion:—

"Street and City Planning," by Mr. W. Harpur, M.Inst.C.E., City Engineer, Cardiff; Mr. Raymond Unwin, and Mr. H. Mitchell Whitley, M.Inst.C.E.

"Construction and Management of Crematoria," to be introduced by Dr. C. Killick Millard, Medical Officer of Health, Leicester.

"Best Method of Mixing and Laying Tar Macadam for Streets and Main Roads," to be introduced by Mr. John S. Brodie, M.Inst.C.E., Borough Engineer and Surveyor, Blackpool.

"Utilisation of Residuals from Refuse Destructors," to be introduced by Mr. H. Percy Boulnois, M.Inst.C.E., and Mr. W. J. Steele, A.M.Inst.C.E., Deputy City Engineer, Bristol.

"Tree Planting in Streets," to be introduced by Mr. W. H. Pettigrew, Superintendent, Park Department, Cardiff Corporation, and Mr. C. Chambers Smith, Engineer and Surveyor, Sutton Urban District Council.

"Is the increasing tendency of sanitary authorities to appoint sanitary inspectors to discharge special duties an advantage to the community as against an inspector being assigned to a smaller district and discharging the entire duties of a sanitary inspector in that district?" to be introduced by Mr. Henry Johnson, Chief Sanitary Inspector, Wimbledon.

In connection with the congress a Health Exhibition of Apparatus and Appliances will be held.

Bankruptcies.

W. J. PAYNE, builder, Fobbing, Essex. R.O., June 11.

E. J. S. STOKES, builder, Poole. R.O. and Adj., June 13.

BURPITT, C. H., builder, Bourton. R.O. and Adj., June 12.

W. J. T. QUILLER, builder, Lostwithiel. R.O. and adj., June 13.

T. SPEAKE, builder and contractor, Church Stretton and Ludlow. Adj., June 13.

T. COWEN (trading as T. Cowen and Co.), painter, decorator and paperhanger, Workington. R.O. and Adj., June 6.

R. JARRITT, shopfitter, Bristol. R.O., June 10. First meeting, O.R.'s, Bristol, June 24, at 12.15. P.E., Guildhall, Bristol, July 17, at 12.

H. CUNDALL, journeyman joiner, late builder, Leeds. R.O., June 11. First meeting, O.R.'s, Leeds, June 24, at 11.30. P.E., C.C., Leeds, July 14, at 11. Adj., June 11

H. RENNARD, master painter and paperhanger, Bingley. R.O., and Adj., June 11. First meeting, O.R.'s, Bradford, June 29, at 11. P.E., C.C., Bradford, July 22, at 10.

W. EICKHOFF (late trading as E. M. Eickhoff), sawyer, Bethnal Green and Hackney Road. First meeting, Bankruptcy Court, June 22, at 1. P.E., Bankruptcy Court, July 16, at 11.

J. POWELL, late builder, Whitstable (formerly of Northampton). First meeting, O.R.'s, Canterbury, June 20, at 11.30. P.E., Municipal Buildings, Canterbury, June 25, at 10.

J. T. BUSH and F. ELLIS (trading as Bush and Ellis, builders, Wardsend, Sheffield). First meeting, O.R.'s, Sheffield, June 24, at 11.30. P.E., C.C., Sheffield, June 25, at 2. Adj., June 13.

J. F. GREENHALGH, architect and surveyor, Leigh-on-Sea, and London, E.C. (formerly of Southend). .O. June 10. First meeting, Bankruptcy Court, London, June 24, at 12. P.E., Bankruptcy Court, London, June 23, at 11.30. Adj. June 10.

Current Market Rates of Materials in the Various Trades.

The quotations given in this list apply only to larger quantities purchased in London (the minimum quantity for which these pricee are applicable being given where practicable). Retail purchasers must expect to pay a reasonable advance on wholesale rates, as well as carriage. The trade discounts for each item have not been considered, as these would be affected by the quantity of the goods purchased. The market rates one month ago for those materials which are subject to any appreciable fluctuations are also given, for purposes of comparison, and as indicating a rise or fall in prices, and for those which are not subject to these changes an endeavour is made to give fair average prices which would in many cases be affected by the quality of the materials required.

BRICKLAYER.

The current rates for Stocks, Flettons, and other common building bricks, and for local facings are not given, as local considerations obviously affect their prices, and readers who may make use of the information given in these columns can readily obtain quotations for themselves.

		Current rates.	Rates for similar materials on June 1.
Best blue pressed Staffordshire bricks	per 1,000	3 5 0	
do. bullnose bricks	do.	3 15 0	
Best Stourbridge fire bricks	do.	4 15 0	

Glazed Bricks.

		Current rates.	Rates for similar materials on June 1.
Best white and ivory white-glazed one side	per 1,000	10 7 6	
do. glazed one end	do.	9 17 6	
do. quoins, bullnose bricks, and bricks glazed on 4½in. side	do.	13 17 6	
do. glazed two sides (double stretchers)	do.	15 17 6	
do. glazed two ends (double headers)	do.	12 17 6	
do. glazed one side and two ends	do.	16 17 6	
do. glazed two sides and one end	do.	17 17 6	
Splays, chamfers, and squints (to an angle of 45 degs.)	do.	15 7 6	
Double bullnose bricks, double splays, round ends, bullnose stops, and mitres	each	0 0 5	
Double bullnosed mitres ...	do.	0 0 7	
Internal angles, 2¼in. radius	do.	0 0 4	
do. do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Best buff and cream	per 1,000	11 17 6	
do. glazed one end	do.	11 7 6	
Other colours, extra ...	do.	4 0 0	
do. quoins, bullnoses, and bricks, glazed on 4½in. sides*	do.	15 17 6	
do. glazed two sides (double stretchers)*	do.	18 17 6	
do. glazed two ends (double headers)*	do.	15 17 6	
do. glazed one side and two ends	do.	19 17 6	
*These bricks in other colours, extra	do.	3 10 0	
do. glazed two sides and one end	do.	20 17 6	
Splays, chamfers, and squints for an angle of 45 degs	do.	19 17 6	
In other colours, extra ...	do.	3 0 0	
Internal angles, 2¼in. radius	each	0 0 5	
do. 4½in. radius	do.	0 0 10	
Moulded bricks (stretchers and headers)	do.	0 0 8	
Ordinary-quality salt-glazed bricks, glazed one side ...	per 1,000	8 17 6	
do. glazed one end	do.	8 7 6	
do. quoins, bullnoses and bricks, glazed on 4½in. sides	do.	12 7 6	
do. glazed two sides (double stretchers)	do.	14 7 6	
do. glazed two ends (double headers)	do.	11 7 6	
do. glazed one side and two ends	do.	15 7 6	
do. glazed two sides and one end	do.	16 7 6	
do. splays, chamfers, and squints for an angle of 45 degs.	do.	13 17 6	
Specially prepared or dipped salt-glazed with plain glazed side or ends, as described above, same price as for best ivory whites	per 1,000		
Ordinary-quality salt-glazed double bullnoses, double splays, round ends, bullnosed stops and mitres	each	0 0 4	
Best dipped salt-glazed do.	do.	0 0 5	
Ordinary salt-glazed double bullnosed mitres	do.	0 0 4	
Best dipped salt-glazed do.	do.	0 0 5	
Ordinary salt-glazed internal angles, 2¼in. radius	do.	0 0 3	
do. 4½in. radius	do.	0 0 5	
Best dipped salt-glazed internal angles, 2¼in. radius	do.	0 0 4	
do. 4½in. radius	do.	0 0 8	
Ordinary salt-glazed moulded bricks (stretchers and headers)	do.	0 0 8	
Best dipped do.	do.	0 0 8	
Second-quality glazed white and ivory white, 30s. per 1,000 less than best white			
Second-quality coloured bricks, same price as best whites of their respective descriptions			
Plain arch bricks £6 per 1,000 above list for respective kinds and colours			£4 per 1,000 above list.
Cambered arch bricks 1s. 2d. each, any kind or colour, if not exceeding 9ins. by 4½ins. by 2 ins			1s. each.
Rich majolica glazed bricks (headers and stretchers)	per 1,000	21 17 6	
do. quoins and bullnoses ...	do.	26 17 6	

Sand, Ballast, Cement, Lime, and Fireclay.

		Current rates.	Rates for similar materials on June 1.
Thames and pit sand ...	per yard	0 7 0	
Thames ballast	do.	0 5 6	
Best Portland cement ...	per cask	0 5 10	
Best ground blue lias lime	per ton	0 19 0	
(NOTE.—The charge for the sacks to be added to prices per ton.)			
Grey stone lime	per yard	0 11 6	
Stourbridge fireclay in sacks	per ton	0 27 6	upwards

MASON, SLATER AND TILER.

The average current prices for stone per foot cube are given in the following list, the railway rates being calculated on the assumption that orders will be given for full truck loads of about 4 tons upwards.

		Current rates.	Rates for similar materials on June 1.
Brown Whitbed Portland stone (in blocks containing on an average 20 ft. cube)	per ft. cube	0 2 0	
White Basebed do.	do.	0 2 1½	
Bath stone	do.	0 1 6	
Beer stone	do.	0 1 6	
Ancaster stone	do.	0 1 10	
Greenshill stone	do.	0 1 10	
Chilmark stone	do.	0 1 9	
Darley Dale stone	do.	0 2 3	upwards
Red Mansfield stone	do.	0 2 4	
Closeburn red freestone ...	do.	0 2 0	
Hard York stone	do.	0 2 10	
do. 6 in. sawn both sides landings (random sizes)	per ft. super	0 2 4	
do. 6 ins. rubbed two sides do.	do.	0 2 7	
do. 3 ins. sawn two sides slabs	do.	0 1 0	
do. 2 ins. self-faced random slabs	do.	0 0 6	
Broken Granite (blue Guernsey), 1¼ ins. ...	per ton.	0 9 9	c.i.f. Thames
do. do. 2 ins. ...	do.	0 9 6	do.
do. do. 2½ins ...	do.	0 9 0	do.
do. (Imperial blue Scotch), 1½ ins.	do.	0 8 9	do
do. do. 2 ins. ...	do.	0 8 6	do.
do. do. 2½ ins. ...	do.	0 [illegible]	do.
do. (Midland Counties), 1½ ins.	do.	0 11 0	London stations
do. do. 2 ins. ...	do.	0 10 9	do.
do. do. 2½ ins. ...	do.	0 10 6	do.
Granite Kerb (Norwegian). 6 ins. by 12 ins. ...	per foot	0 1 4	c.i.f. Thames
do. do. 12 ins. by 6		0 1 4	do.
do. do. 12 ins. by 8		0 1 6	do.
do. (Imperial blue Scotch) 6 ins. by 12 ins.	do.	0 1 3	do.
do. do. 12 ins. by 6		0 1 3	do.
do. do. 12 ins. by 8		0 1 5	do.
do. (grey Jersey), 6 ins. by 12 ins.	do.	0 1 3½	do.
do. do. 12 ins. by 6		0 1 3½	do.
do. do. 12 ins. by 8		0 1 5½	do.
Circular kerb 4d. per foot extra.			
Granite Pitchings (Aberdeen), 3 ins by 5 ins ...	per ton.	1 15 0	do.
do. do. 3 ins. by 6 ins.	do.	1 14 0	do.
do. do. 4 ins. by 5 ins.	do.	1 14 0	do.
do. do. 4 ins. by 6 ins.	do.	1 13 0	do.
do. (Imperial grey Scotch) 3 ins. by 5 ins.	do.	1 10 0	do.
do. do. 3 ins. by 6 ins.	do.	1 9 0	do.
do. do. 4 ins. by 5 ins.	do.	1 9 0	do.
do. do. 4 ins. by 6 ins.	do.	1 7 6	do
do. (grey Jersey), 3 ins. by 5 ins.	do.	1 7 6	do.
do. do. 3 ins. by 6 ins.	do.	1 6 6	do.
do. do. 4 ins. by 5 ins.	do.	1 6 6	do.
do. do. 4 ins. by 6 ins	do.	1 5 0	do.
do. (blue Guernsey), 3 ins. by 5 ins	do	1 14 0	do.
do. do. 3 ins. by 6 ins.	do.	1 13 0	do.
do. do. 4 ins. by 5 ins.	do.	1 13 0	do.
do. do. 4 ins. by 6 ins.	do.	1 12 0	do.

Slates.

		Current rates.	Rates for similar materials on June 1.
*Best blue Bangor Countess slates	per 1,000 of 1,200	13 0 0	upwards
do. 20 ins. by 12 ins.	do.	13 15 0	
First-quality Bangor Countess slates	do.	12 17 6	
do. 20 ins. by 12 ins.	do.	13 10 0	
do. Ladies	do.	7 5 0	
Permanent green Countess slates	do.	11 10 0	upwards
do. 18 ins. by 10 ins. ...	do.	9 10 0	
do. Ladies	do.	6 10 0	
Best "Eureka" unfading green Countess slates ...	do.	15 15 0	
do. 20 ins. by 12 ins. ...	do.	18 7 6	
do. 18 ins. by 10 ins. ...	do.	13 5 0	
do. Ladies	do.	10 5 0	
Best blue Portmadoc Countess slates	do.	13 10 0	
do. Ladies	do.	6 10 0	

**These prices are for lots not less than 4 tons.*

Tiles.

		Current rates.	Rates for similar materials on June 1.
Plain red roofing tiles ...	per 1,000	2 2 0	
do. hip and valley tiles ...	per doz.	0 3 6	
Best Broseley tiles	per 1,000	2 10 0	
do. ornamental tiles	do.	2 15 0	
do. hips and valley tiles ...	per doz.	0 3 10	
Edwards's (Ruabon) brindled red or brown tiles ...	per 1,000	2 17 6	
do. ornamental do.	do.	3 0 0	
Valley tiles	per doz.	0 3 9	
Hip tiles	per doz.	0 4 0	
Peake's mottled or red Staffordshire tiles	per 1,000	2 12 0	
do. ornamental do.	do.	2 15 0	
Valley tiles	per doz.	0 3 6	
Hip tiles	do.	0 4 0	
Best "Rosemary" plain tiles	per 1,000	2 8 0	
do. ornamental do.	do.	2 10 0	
Valley tiles	per doz.	0 3 8	
Hip tiles	do.	0 4 0	
"Hartshill" sand-faced tiles	per 1,000	2 10 0	
do. pressed do.	do.	2 7 6	
do. ornamental	do.	2 10 0	
Valley tiles	per doz.	0 3 5	
Hip tiles	do.	0 4 0	

CARPENTER AND JOINER.

		Current rates.	Rates for similar materials on June 1.
Fir timber best middling Danzig	per load	4 15 0	
Seconds	do.	4 10 0	
Riga and Libau, full size	do.	3 5 0	
Swedish Balks	do.	3 0 0	
Pitch-pine (average 30 ft.)	do.	4 5 0	
Swedish Deals, 3 ins. by 11 ins., and 4 ins. by 11 ins. 1st quality	per standard	22 10 0	
do. 2nd do.	do.	20 0 0	
do. 3rd do.	do.	13 10 0	
do. 4th do.	do.	11 5 0	
do. 1st quality 3 ins. by 9 ins.	per standard	19 10 0	
do. 2nd do. do.	do.	16 0 0	
do. 3rd do. do.	do.	12 10 0	
do. 4th do. do.	do.	11 10 0	
Swedish Battens, 2½ ins. by 7 ins. 1st quality	per standard	14 10 0	
do. 2nd do.	do.	13 0 0	
do. 3rd do.	do.	11 10 0	
do. 4th do.	do.	10 10 0	
Battens, 2½ ins. by 6 ins., 2 ins. by 6 ins., and 2 ins. by 4 ins. do.	do.	9 10 0	
do. 2 ins. by 4½ ins. and 2 ins. by 5 ins.	do.	9 0 0	
For foreign sawn boards 1 in. by 7 ins. and 1¼ ins. by 7 ins. add to price of battens	do.	0 10 0	
For ¾ in. do. add	do.	1 0 0	
White Sea first yellow deals 3 ins. by 11 ins. (average price)	do.	24 0 0	
For 3 ins. by 9 ins. deduct	do.	2 0 0	
Second yellow deals 3 ins. by 11 ins.	do.	19 0 0	
For 3 ins. by 9 ins. deduct	do.	2 0 0	
Third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	12 0 0	
White Sea first yellow battens 2½ ins. by 7 ins. and 3 ins. by 7 ins.	do.	17 0 0	
Second do.	do.	13 10 0	
Third do.	do.	11 10 0	
Petersburg first yellow deals 3 ins. by 11 ins.	do.	21 10 0	
For 3 ins. by 9 in. deduct from above	do.	4 0 0	
do. second yellow deals 3 ins. by 11 ins.	do.	14 0 0	
For 3 ins. by 9 ins. deduct	do.	1 10 0	
do. third yellow deals 3 ins. by 11 ins. and 3 ins. by 9 ins.	do.	11 0 0	

		Current Rates.	
Petersburg battens, 1st	per standard	14 0 0	
do., second	do.	11 10 0	
do. third	do.	10 10 0	
White Sea, first white deals, 3 ins. by 11 ins.	do.	15 10 0	
For 3 ins. by 9ins. deduct from above	do.	1 0 0	
do., second white deals 3 ins. by 11 ins.	do.	13 10 0	
For 3 ins. by 9 ins., deduct from above	do.	1 0 0	
do., first white battens ...	do.	11 0 0	
do., second do.	do.	10 0 0	
Pitch-pine deals	do.	19 6 0	
Add for less than 2 ins. thick	do.	0 10 0	
First yellow pine regular sizes	do.	40 0 0	
do., oddments	do.	32 0 0	
Second yellow pine regular sizes	do.	33 0 0	
do., oddments	do.	28 0 0	
American whitewood planks	per ft. cube.	0 4 6	
Kauri pine planks	do.	0 4 0	
1 in. by. 7 ins. yellow flooring, planed and shot ...	per square	0 14 0	
Add, if matched	do.	0 0 6	
1¼ in. by 7 ins. yellow, planed and matched ...	do.	0 16 6	
1 in. by 7 ins., white planed and shot	do.	0 12 6	
1 in. by 7 ins., white, planed and matched ...	per square	0 13 0	
1¼ in. by 7 ins., do.	do.	0 15 6	
¾ in. by 7 ins., yellow matched boarding, beaded or V-jointed	do.	0 11 6	
1 in. by 7 in., do.	do.	0 15 0	
¾ in. by 7 ins., white do.. ...	do.	0 10 0	
1 in. by 7 ins. do.	do.	0 13 0	
For 6 ins. boards deduct from the above prices ...	do.	0 6 9	

Hardwoods.

Teak	per load	18 0 0	
Danzig and Stettin oak logs (large)	per ft. cube	0 3 0	
do., small	do.	0 2 6	
Wainscot oak logs	do.	0 5 9	
Dry wainscot oak (in the 1 in.)	per ft. super	0 0 9	
¾ in. do., do.	do.	0 0 7	
Dry Honduras mahogany (Tabasco), in the 1 in. ...	do.	0 0 10	
do., selected Figury do. ...	do.	0 1 8	upwards
do., American walnut do....	do.	0 0 10	

FOUNDER AND SMITH.

Cast-iron columns and stanchions, including patterns	per ton	7 10	
do., drain pipes, 3 ins. diameter, L.C.C. weights, in 9 ft. lengths, coated with solution	per yard	0 2 4	
do., do., 4 ins. diameter ...	do.	0 3 0	
do., do., 5 ins., do.	do	0 3 10	
do, do., 6 ins., do.	do.	0 4 6	
do., do., 9 ins., do.	do.	0 6 3	
Rolled steel joists, Belgian (ordinary section)	per ton	5 10 0	
do., English	do.	7 0 0	
Rolled steel fencing wire...	do.	7 0 0	
do., galvanised	do.	9 0 0	
Steel compound girders (ordinary section)	do.	9 5 0	
Angles, channels, etc., do.	do.	9 5 0	
Galvanised sheets, common brands	do.	13 10 0	
Wrought-iron gas tubes (current discount off standard lists)	p.c.	70 p.c.	
do., water tubes	do.	67½ p.c.	
do., steam tubes	do.	62½ p.c	
do., galvanised gas tubes...	do.	57½ p.c.	
do., do., water tubes ...	do.	55 p.c.	
do., do., steam tubes ...	do.	50 p.c.	

		Current Rates.	
Expanded metal lathing, ⅜ in. mesh (short way) 24 gauge, in quantities of not less than 300 yds. ...	per yard	0 0 10	
do., 22 gauge	do.	0 1 3½	
do., 20 gauge	do.	0 1 5½	
do., ¼ in. mesh, 24 gauge...	do.	0 0 10½	
do., 22 gauge	do.	0 1 4½	
do., 20 gauge	do.	0 1 6½	

(For quantities of between 300 and 700 yds. deduct approximately 10 per cent. from above; for quantities of between 700 to 1,400 yds., deduct approximately 15 per cent.)

PLUMBER, COPPERSMITH, AND GLAZIER.

Sheet lead, 3 lbs.	per ton	16 15 0	17 4 0
do., above 3 lbs.	do.	10 5 0	16 14 0
Lead water pipe up to 2 in.	do.	16 15 0	17 4 0
Lead barrel pipe	do.	17 15 0	18 4 0
Lead pipe, tinned inside ...	do.	43 12 6	44 1 6
do., and washed outside ...	do.	46 2 6	46 11 0
do., soil pipe, up to 4½ ins.	do.	19 15 0	20 4 0
do., do., to 6 ins.	do.	20 15 0	21 4 6
do., do., above	do.	21 10 0	21 19 0
Lead sash weights	do.	19 5 0	19 14 0
Sheet zinc	do.	28 0 0	upwards
Copper sheets	do.	71 0 0	
do., nails	per lb.	0 0 11	
do., wire	do.	0 0 10	
Plumber's solder	per ton	65 0 0	
Tinman's solder	do.	80 0 0	
Old lead (against account, etc.)	do.	11 15 0	12 0 0
Clean scrap copper, do ...	per cwt.	2 12 0	
do. ...	do.	2 0 0	2 1 0
Old zinc, do.	do.	0 14 6	0 15 0
15 oz. English sheet glass, thirds (in crates)	per foot	0 0 2¼	
do., do., fourths	do.	0 0 1¾	
21 oz. do., do., thirds ...	do.	0 0 3	
do., do., fourths	do.	0 0 2	
26 oz., do., do., thirds ...	do.	0 0 3	
do., do., fourths	do.	0 0 3½	
32 oz., do., do., thirds ...	do.	0 4	
do., do., fourths	do.	0 0 3½	
For obscured sheet glass add to fourths	do.	0 0 1	
15 oz. fluted sheet	do.	0 0 3¼	
21 oz., do., do.	do.	0 0 4	
For obscured fluted sheet, add to above	do.	0 0 1	
⅛ in. plain rolled plate ...	do.	0 0 2¼	
3-16 in., do., do.	do.	0 0 2½	
¼ in. do., do.	do.	0 0 3	
For rolled fluted plate add to the above prices ...	do.	0 70	

New London Buildings.

The following applications were among those submitted to the London County Council at their meeting yesterday, with the recommendation of the Building Act Committee, that they should receive the consent of the Council.

Building between "Southleigh" and the post office, on the eastern side of Alleyn Park, Dulwich, on the application of H. H. Bartlett (*consent*).

Conservatory at No. 93, Amhurst Park, Stoke Newington, on the application of J. Savage, on behalf of T. H. Dey (*consent*).

Wooden oriel window in front of No. 75, Eardley Crescent, Kensington, on the application of S. J. Webber, on behalf of J. L. Middleton (*consent*).

Bay window and hood in front of No. 18, Cottesmore Gardens, Kensington, on the application of F. E. Williams, on behalf of F. Arnold-Baker (*consent*).

Motor house in front of No. 58, Finchley Road, St. Marylebone, on the application of Anscombe and Ringland, on behalf of G. T. Harrap (*consent*).

Houses in Burntwood Lane, Herondale Avenue, and Loxley Road, Wandsworth, on the application of Holloway Brothers (*consent*).

Five houses on the northern side of Kingscourt Road, Wandsworth, on the application of Gray and Murphy (*consent*).

Addition at the third floor level of the Hospital for Sick Children, Great Ormond Street, Holborn; the uniting of the building with No. 44, Great Ormond Street; and the construction of a gangway between the third floor of the out-patients' department of the hospital and the second floor of the nurses' house, on the application of C. E. Barry, on behalf of the chairman and governors of the hospital (*consent*).

Working-class dwellings to be erected upon a site on the eastern side of Church Street, Deptford, on the application of W. H. Gritten, on behalf of Wheeler Bros. (*consent*).

Working-class dwellings to be erected on a site situated between Leman Street and Rupert Street, Whitechapel, on the application of Gilbert and Constanduros, on behalf of Hickman and Bromet (*consent*).

Three dwelling-houses on low-lying land situated at Willow Street, on the application of Edward Cross and Co. (*consent*).

Additional block at the premises of Frederick Gorringe, Ltd., Buckingham Palace Road, and Brewer Street, St. George, Hanover Square, on the application of A. E. Hughes and Son on behalf of Frederick Gorringe, Ltd. (*consent*).

One-storey shop in front of 79, Victoria Street, Westminster, on the application of T. Ballantine, on behalf of Kaufer and Sterh (*consent*).

Buildings upon the site of Nos. 4 to 16, Cottage Lane, City Road, Finsbury, on the application of R. Peters, on behalf of the trustees of the late C. Hall (*consent*).

Transformer chamber at Castle's Wharf, River Bank, Anchor and Hope Lane, Charlton, on the application of J. Stanley Heath, on behalf of Castle and Sons (*consent*).

Van sheds, stables and a manager's house at Birch Brothers' premises, Gasholder Place, and Upper Kennington Lane, Kennington, on the application of P. Dollar, on behalf of Messrs. Birch Brothers (*consent*).

New station, to be known as Shooter's Hill and Eltham Park Station, on the eastern side of Westmount Road, Eltham, on the application of J. W. Watkin, on behalf of the South-Eastern and Chatham Railway Companies Joint Committee (*consent*)

Additions at No. 147, Church Street, Chelsea, on the application of J. M. Smith, on behalf of Captain Adrian Jones (*consent*).

Buildings upon a site at the junction of Hornsey Rise and Upper Hornsey Rise, Hornsey, on the application of E. Bates (*consent*).

Building to abut upon Cloak Lane, Dowgate Hill, and Cannon Street, City, on the application of Ford, Son, and Borrows, on behalf of the Metropolitan and District Railways Joint Committee and Gruntwag and Morton (*consent*).

Warehouse building on the site of No. 40, Artillery Lane, Whitechapel, at less than the prescribed distance from the centre of the roadway of Parliament Court, on the application of W. A. Lewis, on behalf of Mrs. P. Karamelli (*consent*).

Building upon the site of Nos. 40, 41, and 42, North Audley Street, St. George, Hanover Square, with bay windows, an angle turret and a projecting shop front, on the application of R. G. Hammond, on behalf of Mr. J. Garlick (*consent*).

Building upon the site of Nos. 1 to 13, Bell's Buildings, Salisbury Square, Fleet Street, City, with a division to exceed 250,000, but not 450,000 cubic feet in extent, on the application of Mr. F. W. Foster, on behalf of Mrs. C. W. Millar (*consent*).

Building upon the site of No. 23, New Cavendish Street, St. Marylebone, with an irregular open space at the rear, on the application of Mr. F. M. Elgood, on behalf of Mr. J. A. Michell (*consent*).